Rapidpoint® 400 Series

pwd 12345

machine ICON

Service Manual

Bayer HealthCare

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The Rapidpoint 400 system is for *In Vitro* Diagnostic Use.

Origin: UK

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EC REP Bayer Diagnostics Mfg (Sudbury) Ltd
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The information in this manual was correct at the time of printing. However, Bayer HealthCare continues to improve products and reserves the right to change specifications, equipment, and maintenance procedures at any time without notice.

If the system is used in a manner differently than specified by Bayer HealthCare, the protection provided by the equipment may be impaired. See warning and hazard statements.

Table of Contents

Preface

This manual is to be used with the Bayer HealthCare Rapidpoint® 400 series system. It provides the information and procedures necessary to service the Rapidpoint 400 series system. Related documents include the following:

- *Rapidpoint 400 Series Operator's Manual*
- *Rapidpoint 400 Series Reference Guide*
- *Rapidpoint 400 Series Interface Specification Manual*

This manual is designed to meet the needs of Bayer HealthCare Service Representatives and biomedical engineers who perform installation, replace parts, and troubleshoot the Rapidpoint 400 *series* system.

Conventions Used in this Manual

This manual uses the following text and symbol conventions.

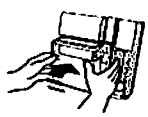
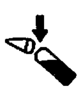
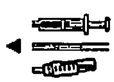
Convention	Description
Bold	Bold type indicates a button on the screen. For example, if the word "setup" appears as **Setup**, it refers to the button labeled Setup. Buttons that you use frequently are represented on the screen with a symbol instead of text. In this manual, these button names appear in bold with the word button after them. For example, "the **Continue** button" refers to the button in the lower right corner of the screen that you touch to advance to the next screen. You can refer to the *Rapidpoint 400 Series Reference Guide* on the system or to *Buttons* in Section 5 of the *Rapidpoint 400 Series Operator's Manual* to identify the buttons that are represented by symbols.
italic	Italic type refers to the title of a document or a section title in this manual. For example, *Mechanical Descriptions* refers to the first section of this manual.
405	Information appropriate for Rapidpoint 405 systems.
	**Biohazard** statements alert you to potentially biohazardous conditions.

(Continued)

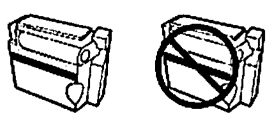
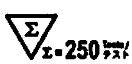
Convention	Description
WARNING	Warning statements provide information about a condition that may cause personal injury.
	Caution statements provide information about conditions that may cause product damage or loss of data.
NOTE	Note statements alert you to important information that requires your attention.

Understanding the Symbols

This section describes the symbols that may appear on the exterior of the system. The symbols provide you with the location of certain components and with warnings for proper operation.

Symbol	Description
	This symbol reminds you to push the measurement cartridge firmly to lock it in place.
	This symbol identifies the area on the wash/waste cartridge where you push to install the cartridge correctly.
	This symbol identifies the ampule breaker where you insert ampules to break off the top.
	This symbol indicates where you insert the sample device (syringe, capillary, or ampule) to perform analysis.
	This symbol cautions you about the risk of exposure to biohazards.
	This symbol indicates a hazard or danger is associated with the product.
	This symbol cautions you about the risk of exposure to potential electrical hazards.
	This symbol indicates that the input electricity is alternating current.
	This symbol alerts you to important information about the fuses.

(Continued)

Symbol	Description
	This symbol identifies that the system is type B equipment, which provides a particular degree of protection against electric shock.
I	This symbol indicates that the main power supply is on.
O	This symbol indicates that the main power supply is off.
Class 1	This symbol indicates that the system is class 1 type equipment, which has basic insulation and additional safety grounding precautions. Reference Underwriters Laboratories Document for *Medical Electrical Equipment, Part 1: General Requirements for Safety*, UL 2601-1.
UL	This symbol indicates that the system is approved by UL as meeting U.S. requirements for safety.
CE	This symbol indicates that the system meets the requirements of the European Union.
SP NRTL /C	This symbol indicates that the system is approved by CSA as meeting the U.S. and Canadian requirements for safety.
	This symbol indicates the type of measurement cartridge that can be installed on the system.
	This symbol indicates the area to write the date the cartridge is installed on the system, if required.
	This symbol cautions you not to spray this area with cleaning solutions or other fluids that may damage sensitive parts of the system.
IVD	*In vitro* diagnostic device
	Consult instructions for use
	Temperature limitation (2°C - 8°C)
	Contains sufficient for (n) tests (250 tests)
REF	Catalog number

(Continued)

Symbol	Description
SN	Serial number
LOT	Batch code
	Manufactured by
EC REP	Authorized Representative

Understanding Result Symbols

The following symbols identify results that are out of range or that need your attention. These symbols and results appear in red on the screen. They also appear on the report. The ranges can appear on the printed report, if this option is selected in Setup.

This symbol . . .	Indicates that . . .
↑	the result is above range.
↓	the result is below range.
-----↑	the result is above the reporting range.
-----↓	the result is below the reporting range.
?	the system has an atypical response when measuring this parameter. The system does not report results for other parameters that use the affected parameter. For example, if ? appears with the chloride (Cl^-) result, the system does not report a result for anion gap (AnGap). When this symbol appears with the hematocrit (Hct) result, it may indicate that the result was not corrected for sodium (Na^+) because sodium failed Required QC analysis. Analyze the sample again, if possible.
u	the hematocrit (Hct) result was not corrected for sodium (Na^+) because the sodium sensor is out of calibration or because the sodium measurement is beyond the reporting range.

Mechanical Descriptions

Overview

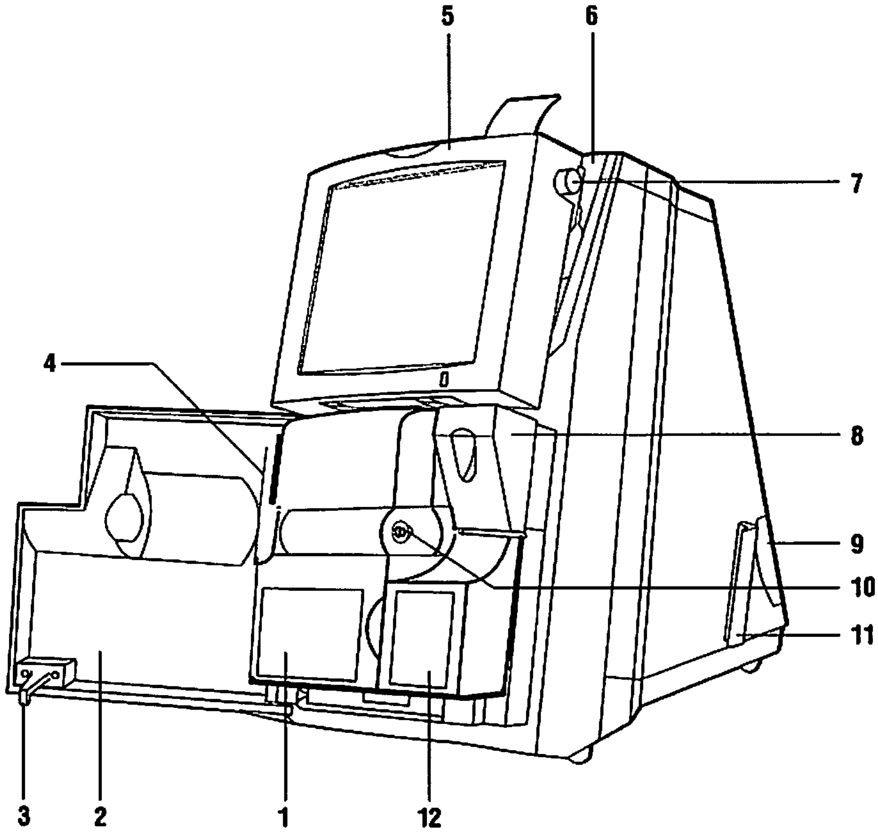
This section describes the mechanical components of the Rapidpoint 400 series systems. Each component contains individual modules that perform a series of related functions. The Rapidpoint 400 series systems consists of the following components:

- Measurement cartridge
- Wash/waste cartridge
- AutomaticQC cartridge
- Pumps
- Display
- CO-oximeter

The Base Model

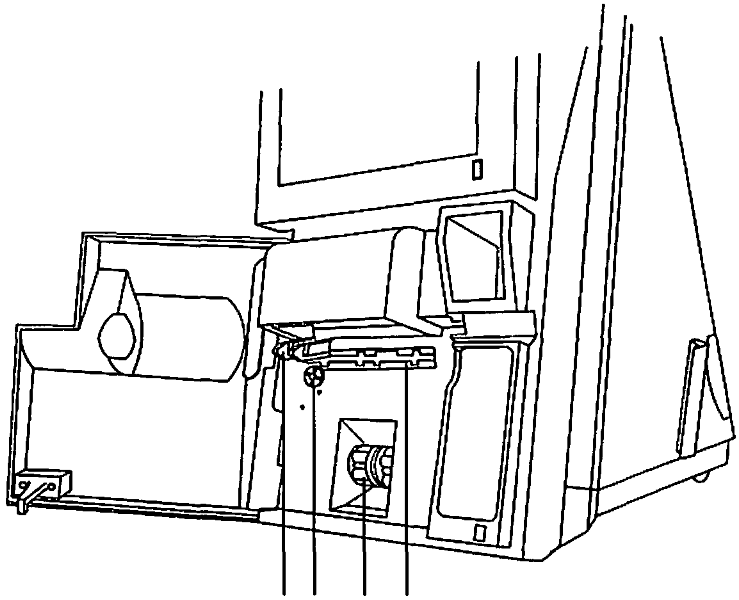
The base model refers to the 400 system model.

Rapidpoint 400 Series System (door open)



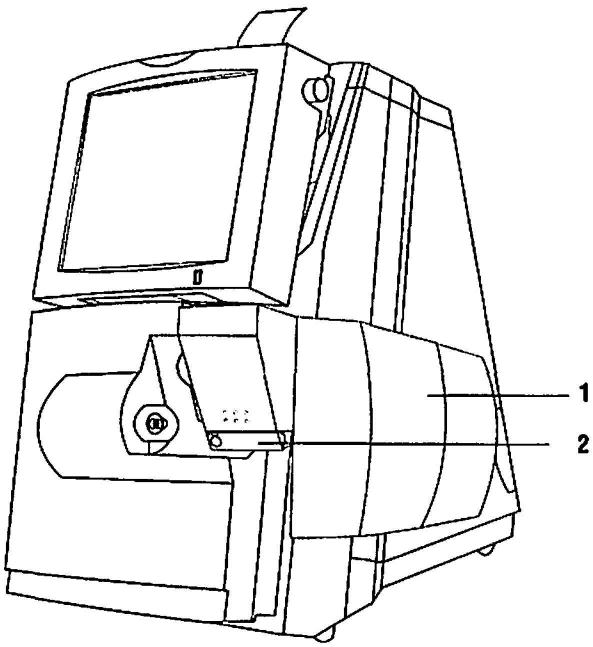
1	Measurement cartridge	**7**	Paper advance knob
2	Door	**8**	Ampule breaker
3	Door latch	**9**	Air filter carrier
4	Cartridge handle	**10**	Sample port
5	Display	**11**	Support bracket for AutomaticQC cartridge
6	Printer	**12**	Wash/waste cartridge

Rapidpoint 405 System (door open)



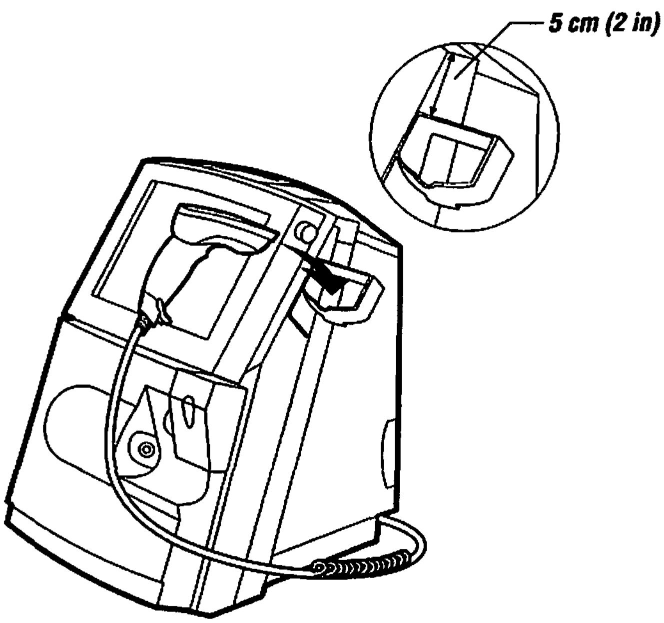
1 **Optic Head Assembly:** Delivers and collects light from the CO-ox sample chamber.
2 **Drive Wheel:** Opens and closes the CO-ox sample chamber.
3 **Pumps:** Move samples and reagents through the measurement and wash/waste cartridges.
4 **Valve Actuator:** Moves the valve that controls flow of the sample and reagents.

Rapidpoint 400 Series System with AutomaticQC Cartridge Installed

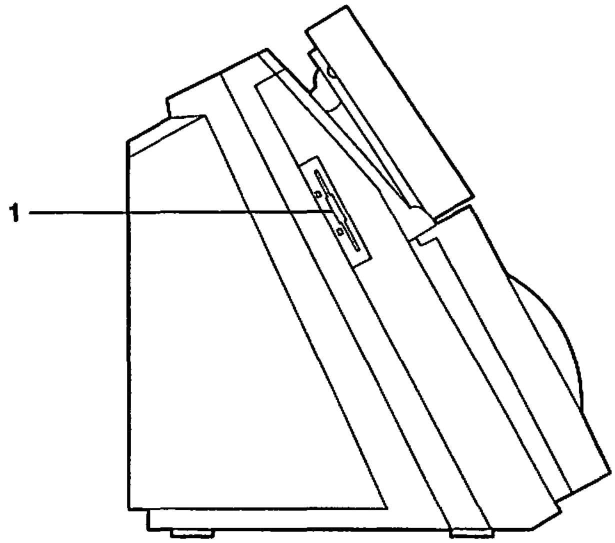


1 AutomaticQC cartridge
2 Cartridge connector

Rapidpoint 400 Series System with Bar Code Scanner Holder

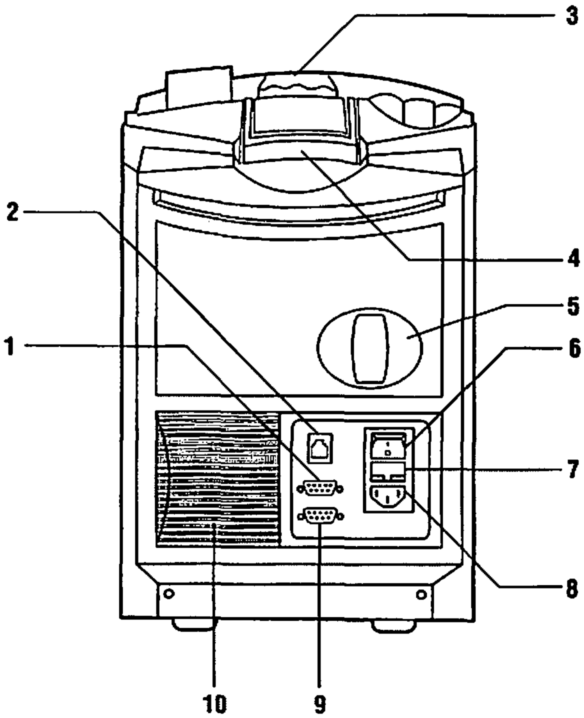


Rapidpoint 400 Series System (left side)



1 Diskette drive

Rapidpoint 400 Series System (rear view)



1 **Serial Port:** Allows serial connection to a Rapidlink data management system or an LIS.

2 **Network Port:** Allows network connection to a Rapidlink data management system.

3 **Screen Latch:** Allows you to adjust the viewing angle of the screen.

4 **Handle:** Helps you to move the system.

5 **Co-ox Lamp:** Appears only in Rapidpoint 405 systems.

6 Power Switch

7 Fuse Compartment

8 Power Input

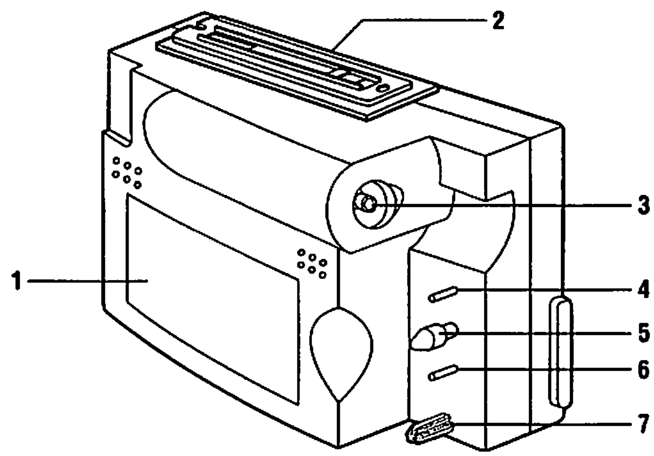
9 **Bar Code Port:** Allows you to connect the optional bar code scanner to the system. The scanner allows you to identify patient and QC samples by scanning their bar codes.

10 Air Filter

Measurement Cartridge

The self-contained measurement cartridge is non-serviceable. It consists of the fluidic components, reagents, and sensors that measure patient and QC samples.

Measurement Cartridge



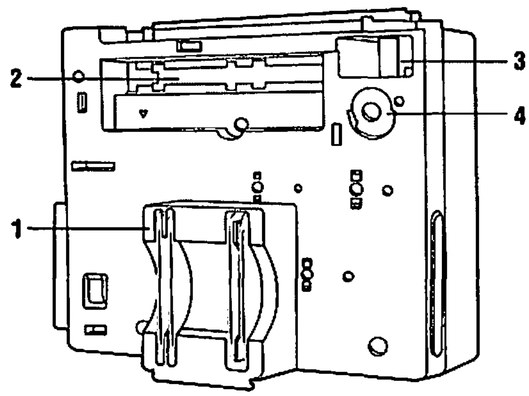
1 Internal fluidic components and reagents
2 Sensor module
3 Sample port
4 Input to waste bag
5 Primary alignment pin
6 Output from wash bag
7 Secondary alignment pin

In addition, the measurement cartridge contains the mechanical components that interface with the following components:

- the reagent system with the peristaltic pumps
- the sensor module with the electronic components
- the wash/waste cartridge
- the thermal control

The external area of the cartridge consists of the platen area which contains the pump tubing. When the measurement cartridge is installed and locked into place, the roller cage of the base unit is positioned against the pump tubing to move the reagents, the samples, and the wash fluids through the system.

The measurement cartridge is protected by a door that locks in place. The door provides an electrostatic shield for the measurement system. A mechanical microswitch senses when the door is open or closed.



5 Pump tubing

6 Sliding valve

7 CO-ox Sample chamber

8 Drive wheel interface

Measurement cartridges can analyze a total of 750 patient and/or QC samples, and measure blood gases, electrolytes, glucose, total hemoglobin, and hemoglobin derivatives in arterial, venous and capillary whole blood samples. Each cartridge is stable for 28 days after installation on the system when the cartridge is installed by the date on the label. The Install-by date indicates the last date on which the cartridge can be installed and still have 28 days of use before expiration.

System	Parameters Determined and Reported
400	pH, pCO_2, pO_2, Na^+, K^+, Ca^{++}, Cl^-, glucose, Hct
405	pH, pCO_2, pO_2, Na^+, K^+, Ca^{++}, Cl^-, glucose, tHb, FO_2Hb, *F*HHb, *F*MetHb, *F*COHb

If a cartridge is installed after the Install-by date, it is stable for the number of days remaining before expiration, that is, 28 days minus the number of days past the Install-by date. View the Status screen to see the number of days remaining and the expiration date. You cannot install a cartridge if only 1 day of use is remaining. The system prompts you when you need to replace the cartridge.

Store cartridges refrigerated at 2 to 8°C. Cartridges can also be stored at room temperature, not to exceed 25°C, for up to 14 days.

Measurement Cartridge Fluidics

The fluidic components of the measurement cartridge are part of the fluidics system, which involves the measurement cartridge, the wash/ waste cartridge, and the pumps. The measurement cartridge fluidics consist of the following components:

- sample entry
- sliding valve
- tubing
- reagent system
- sensor module
- KCl reservoir

Sample Entry

The sample entry performs the following functions:

- provides an insertion point for syringes and capillaries
- holds syringes, capillaries, or aspiration adapters during sample aspiration
- connects to the wash and waste ports for automatic cleaning

The sample entry components consist of a luer and capillary seal. The capillary seal has two passages that provide pathways for the wash and waste fluids. The sample port attaches to the sliding valve assembly with two snaps. The capillary seal provides a seal to the sample probe during aspiration from a capillary.

Sliding Valve

The sliding valve performs the following functions:

- aspirates the wash fluid
- aspirates QC samples
- selects and aspirates reagents
- automatically aspirates samples from capillaries and syringes
- provides a fluid path from the reagent bag to the sensor module

The sliding valve consists of a luer, a luer mount, a probe, a probe clamp, a luer mount cover, a luer mount extension, and a valve seal. The luer and capillary seal are replaceable. Valve movement is controlled by a valve actuator motor and a position detector system. The position detector system accurately positions the valve using two position sensors, which are part of the cartridge interface.

The sliding valve has nine positions, each of which allows fluid, air, or sample to be pumped through a thin stainless-steel probe in the center of the valve. The probe remains stationary while the valve moves back and forth around the probe to change the hydraulic path of the system.

The following table shows the valve positions and their functions:

Position Name	Function
SYRINGE_POS	moves the valve to place the probe tip into the syringe creating the fluid path for sample aspiration
Vent AQC	controls the aspiration of an external QC sample, using the front hole of the probe
Zero Reagent Load	aspirates the Zero Calibration Reagent into the sensor module, using the rear hole in the probe
Hematocrit Reagent Load	aspirates the Hematocrit Calibration Reagent into the sensor module, using the rear hole in the probe
200 Reagent Load	aspirates the 200 Calibration Reagent into the sensor module, using the rear hole in the probe
Wash Reagent Load	delivers steady wash to the sensor module, using the rear hole in the probe
Luer Wash	empties the luer area from a port in the bottom of the sample entry, using the front hole of the probe and aspirates capillary samples while the device is in place
Capillary Aspiration	aspirates samples from capillary tubes, using the front hole in the probe
Vent	provides an opening to advance syringe samples while the device is in place
Syringe Aspiration	aspirates syringe or QC samples

Tubing

All tubing is enclosed within the cartridge, except for the pump tubing in the platen area at the rear of the cartridge. The platen area has four tubes. The two tubes on the right serve as the flow paths for foam wash and connect the measurement cartridge to the wash/waste cartridge. The two tubes on the left serve as the flow paths for KCl, the sample, and reagents.

The sample tube pulls the sample or reagent through the sensors and pushes it out into the wash/waste cartridge.

Reagent System

The reagent system delivers reagents and gases to the measurement cartridge. The measurement cartridge contains enough reagents to operate the system for 28 days.

The reagents are contained in three foil bags. Each bag contains a fitting. When the measurement cartridge is installed and locked into place, pierce pins, which are part of the interface assembly, puncture each bag creating a fluid path. The pierce pins create a seal between the pierce probes and fitting on each bag.

The following table describes the measurement cartridge reagents:

Reagent	Volume	Ingredients	Cartridge
Zero	75 mL	gases (oxygen, carbon dioxide, nitrogen), salts (alkali halides), organic buffers, catalyst, and surfactant	measurement
RCx	60 mL	gases (oxygen, carbon dioxide, nitrogen), salts (alkali halides), organic buffers, surfactant, and preservative	measurement
200	230 mL	gases (oxygen, carbon dioxide, nitrogen), salts (alkali halides), organic buffers, glucose, surfactant, and preservative	measurement
Reference	16 mL	potassium chloride, silver chloride, and surfactant	measurement
Wash	250 mL	gases (oxygen, carbon dioxide, nitrogen), salts (alkali halides), surfactant, and preservative	wash/waste

The following table lists the calibration points for each analyte in the reagents:

Analyte	High Calibration Point	Low Calibration Point
pH	7.4	6.8
pCO_2	70 mmHg	35 mmHg
pO_2	154 mmHg	0 mmHg
Na^+	159 mmol/L	116 mmol/L
K^+	8.0 mmol/L	4.0 mmol/L
Ca^{++}	1.25 mmol/L	0.62 mmol/L
Cl^-	98 mmol/L	69 mmol/L
Glu	180 mg/dL	0 mg/dL
Hct	45%	0%
tHb	15 g/dL	0

Sensor Module

The sensor module consists of the following sensors:

- reference sensor
- analyte sensors
- hematocrit sensor
- CO-ox sample chamber

The sample arrives at the sensor module after traveling from a stainless steel probe, through the sample tubing, and to the preheater. The sample then passes over the sensors for analysis.

The sensor module provides measurements for pH, pO_2, pCO_2, sodium, potassium, ionized calcium, chloride, glucose, Hct, total hemoglobin, and hemoglobin derivatives in arterial, venous and capillary whole blood samples.

The parameters that the Rapidpoint 400 series systems report depend on the parameters selected in Setup. Refer to Appendix C in the *Rapidpoint 400 Series Operator's Manual* for a detailed description of the parameters that are available.:

Category	Parameter	Description
blood gases	partial pressure of carbon dioxide; pCO_2	partial pressure of carbon dioxide
	partial pressure of oxygen; pO_2	partial pressure of oxygen
	H^+	hydrogen ion concentration
	pH	negative log of the hydrogen ion concentration
electrolytes	sodium; Na^+	sodium ion concentration
	potassium; K^+	potassium ion concentration
	ionized calcium; Ca^{++}	concentration of ionized calcium, the physiologically active form of calcium in the blood
	chloride; Cl^-	chloride ion concentration
metabolites	glucose; Glu	glucose concentration
oxygenation	hematocrit; Hct*	the volume occupied by red blood cells in a given volume of blood; value is determined by conductimetric method
metabolic parameters	bicarbonate ion; HCO_3 act, HCO_3-std	the bicarbonate ion concentration and the bicarbonate ion concentration normalized to a pCO_2 of 40 mmHg
	base excess; BE(B), BE(ecf)	an approximation of the amount of acid or base needed to titrate a liter of blood to a pH of 7.4
	total carbon dioxide; $ctCO_2$	the sum of the dissolved carbon dioxide and the plasma bicarbonate
temperature-corrected parameters	temperature-corrected pH, pCO_2, and pO_2; pH(T), pCO_2(T), and pO_2(T)	blood gas values corrected for entered patient temperature
	respiratory index; RI(T)	the ratio of the alveolar-arterial blood oxygen-pressure difference to arterial pO_2 when both values are corrected for patient temperature

Category	Parameter	Description
	alveolar-arterial oxygen tension difference; pO_2(A-a)(T)	an index of gas exchange within the lungs
	arterial-alveolar oxygen tension ratio; pO_2(a/A)(T)	an index of oxygenation
	physiologic shunt; Qsp/Qt(T)†	percent of blood that does not participate in external respiration
	estimated physiologic shunt; Qsp/Qt(T)est†	estimated value for the percent of blood that does not participate in external respiration
oxygenation parameters	estimated oxygen saturation; O2SAT(est)	the ratio of the volume of oxygen carried to the maximum volume of oxygen that the hemoglobin can carry
	hematocrit, Hct'	an calculated value determined from the total hemoglobin value
	estimated total hemoglobin; ctHb(est)	an estimation of the hemoglobin contained in the sample
	pO_2/F_IO_2	the ratio of arterial pO_2 to the fraction of inspired oxygen
	calcium adjusted for pH 7.4; Ca^{++} (7.4)	the ionized calcium concentration of blood normalized to pH 7.4
	anion gap; AnGap	an approximation of the difference between unmeasured cations and unmeasured anions in the sample
a-v study parameters	arterial-venous oxygen content difference; ctO_2(a-v)†	the difference between arterial and venous blood oxygen content
	arterial oxygen content; ctO_2(a)†	the oxygen content of arterial blood
	mixed venous oxygen content; ctO_2(v)†	the oxygen content of mixed venous (pulmonary artery) blood
	oxygen consumption rate; VO_2†	the volume of oxygen consumed by the body per minute
	oxygen delivery; DO_2†	the volume of oxygen that is transported to the tissues per minute
	a-v extraction index; ctO_2([a-v]/a)†	the arterial-venous oxygen content difference as a percent of arterial oxygen content

Category	Parameter	Description
CO-oximetry Parameters	total hemoglobin; tHb†	the total of all measured hemoglobin fractions
	oxyhemoglobin; FO_2Hb†	hemoglobin that is reversibly bound to oxygen
	carboxyhemoglobin; *F*COHb†	hemoglobin covalently bound to carbon monoxide
	methemoglobin; *F*MetHb†	hemoglobin whose iron is oxidized to its ferric state and is unable to bind oxygen
	hemoglobin oxygen saturation; sO_2†	the ratio of the amount of hemoglobin bound to oxygen to the total amount of hemoglobin able to bind oxygen
	oxygen binding capacity; BO_2†	the maximum amount of oxygen that can be carried by the hemoglobin in a given quantity of blood
	oxygen tension at 50% saturation; p50†	the partial pressure of oxygenated which the hemoglobin oxygen saturation is 50%

* These parameters are available only on Rapidpoint 400 systems.

† These parameters are available only on Rapidpoint 405 systems.

In addition to sensor chips, the sensor module contains:

- fluid detector chips
- a preheater chip
- an IDEE ROM chip

The Rapidpoint 400 series systems use two Hct sensors as fluid detectors. Fluid detector 1 (FD1) is located in front of the first sensor. Fluid detector 2 (FD2) is located after the last sensor.

The fluid detector chips detect the presence and the continuity of fluids in the system, and measure sample fluid using alternating current (AC) conductivity. The system uses information from the detectors to monitor and control the movement and the positioning of fluids during the system sequences.

The preheater chip is located in front of the measurement block. The sample passes through the preheater during aspiration. The preheater temperature range is 37.0 to 37.6°C, with a target preheater temperature of 37.3°C.

The IDEE ROM chip informs the system that the correct measurement cartridge is installed and helps in diagnosing cartridge problems. The IDEE Rom Identifies the following:

- analyzer software version
- date installed on the analyzer
- date removed fro analyzer (if removed normally)
- analyzer serial number

KCl Reservoir

The KCl reservoir continuously refreshes the KCl concentration on the reference sensor. Each measurement cartridge includes a KCl vial containing 16 mL of liquid KCl.

The KCl reservoir is clamped closed to prevent it from leaking during shipment. The tubing on the KCl vial is automatically unclamped allowing the KCl to flow when the measurement cartridge is installed.

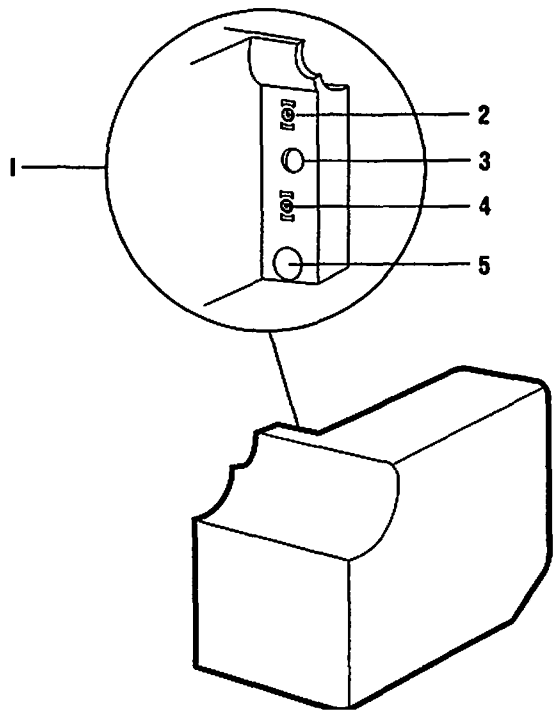
Wash/Waste Cartridge

The wash/waste cartridge is self contained and non-serviceable. It is protected by a door that locks in place. The door provides an electrostatic shield for the measurement system. A mechanical microswitch senses when the door is open or closed.

The cartridge contains the wash fluid, which cleans the sample path after analysis and calibration. The cartridge also contains the waste bag, which stores liquid waste. The wash/waste cartridge consists of the following components:

- seal septums
- pierce probes
- wash bag
- waste bag

Wash/Waste Cartridge



1 Connectors to measurement cartridge
2 Septum seal for waste bag
3 Primary alignment pin locator hole
4 Septum seal for wash bag
5 Secondary alignment pin locator hole

Two seal septums serve as the coupling between the hydraulics of the wash/waste and the measurement cartridges. When the wash/waste cartridge is installed, it connects to two wash/waste cartridge fittings that are located on the outside edge of the measurement cartridge cover. These fittings provide the interface between the measurement cartridge and the wash/waste cartridge. The top fitting is the path into the waste bag. The bottom fitting is the path out of the wash bag. In addition to the wash/waste fittings on the measurement cartridge, there is a primary and a secondary alignment pin. These pins align the wash/waste cartridge fittings with the septums.

When the wash/waste cartridge is placed in the system, the fittings on the measurement cartridge are inserted into the wash/waste cartridge, and the pierce probes penetrate the wash and waste bags. In the case of the wash bag, the pierce probe penetrates the bag and creates a seal inside the fitting. However, the waste bag is already open and the pierce probe seals inside the fitting in the bag. Two bag clamps, one at the top of each bag, hold the bags in position. Two hangers, one at the top of the cartridge and one at the bottom of the cartridge, hold the waste bag in place as it fills.

Only the replaceable cartridges of the Rapidpoint 400 series systems come in contact with biohazardous waste fluid. Biohazardous waste fluid never contacts other components of the system. The waste fluid is completely enclosed in the waste bag, which accommodates 500 mL of waste. The waste collection system has sufficient reserve capacity to prevent overfilling, provided the cartridges are replaced when the operator is prompted to do so by the system.

The wash/waste cartridge contains 250 mL of wash reagent. The wash reagent washes the valve and the sample flow path. It consists of gases (oxygen, carbon dioxide, nitrogen), salts (alkali halides), a surfactant, and a preservative.

Each wash/waste cartridge is stable for 10 days after installation on the system and contains enough reagent for 300 patient and QC sample analyses. The system prompts the user when the cartridge needs to be replaced.

The wash/waste cartridges may be stored refrigerated or at room temperature (2 to 25°C).

Cartridge Interface Module

The cartridge interface module attaches the measurement cartridge to the system. It consists of the following components:

- interface frame
- location pins
- bag pierce pins
- cable clamps
- cartridge handle
- valve actuator
- optical detector board with bidirectional stepper motor and position detectors
- pump and motor assembly (refer to *Pumps* on page 52 for more detailed information)
- thermal cover
- camshaft
- connector block

The interface frame is secured to the front of the system and holds all devices and parts necessary to interface the system with the measurement cartridge.

The location pins position the measurement cartridge on the cartridge interface frame. Three bag pierce pins are below the location pins. The bag pierce pins force the pierce probes to puncture the reagent bags creating a fluid path. The pierce probes engage with the fittings on the reagent bags to make a seal.

Four cable clamps secure the cables that extend from the connector block, the stepper motor, and the optical detector board to the main board.

The cartridge handle lifts to unlock and release the measurement cartridge from the interface module, or pulls down to lock the measurement cartridge in place on the cartridge interface module.

The valve actuator moves the sliding valve. The luer mount extension on the sliding valve connects with the valve actuator when the measurement cartridge locks on the cartridge interface module. During cartridge initialization, the actuator moves back and forth until it automatically engages the luer mount extension. A stepper motor, which has nine positions and a left and a right limit stop, controls the actuator.

The bidirectional valve actuator motor and the position detectors, which are part of the optical detector board, move and position the valve. Two sensors in conjunction with the position detectors determine valve position.

The thermal cover attaches to the cartridge interface module and protects and guides the connector block. The cam shaft, used in conjunction with the cartridge handle, raises and lowers the connector block.

The connector block provides the electrical and the thermal connections to the sensors, and connections to the IDEE ROM. The connector block consists of the following components:

- preheater
- main heater
- contact board
- multiplexer board
- contact system protector
- alignment and locking pins

The preheater contacts the preheater chip in the sensor module to heat samples to 37°C. The preheater is thermally protected, so that the surface temperature never exceeds 55°C.

The main heater contacts the heater plate of the sensor module to maintain the temperature of the sensors and fluids at 37°C. The main heater also controls the temperature of the preamplifiers. The main heater is thermally protected, so that the surface temperature never exceeds 55°C.

The contact board provides the junction between the connector block and the sensor module. It processes signals from the sensors and provides biased, filtered, and amplified results to the system. The sample thermistor is located on the contact board. The sample thermistor senses the temperature on the back of the sensor chips. If the thermistor detects that the temperature of the chips is less than 37°C, it signals the main heater to increase the temperature of the chips to 37°C.

The multiplexer board takes the signals from the contact board and simultaneously transmits them into one signal that travels back to the system. A programmable gain amplifier on the multiplexer board provides the gain and the offset to the signals. The circuitry on the board also amplifies the signal from the thermistor. Additionally, the multiplexer board provides various excitation signals to the contact board, such as power and digital timing signals.

The contact system protector shields the contacts from becoming damaged when no measurement cartridge is present.

There are four alignment pins on the connector block assembly: two small pins align the sensor module with the connector block, and two larger pins guide the connector block into position.

AutomaticQC Cartridge

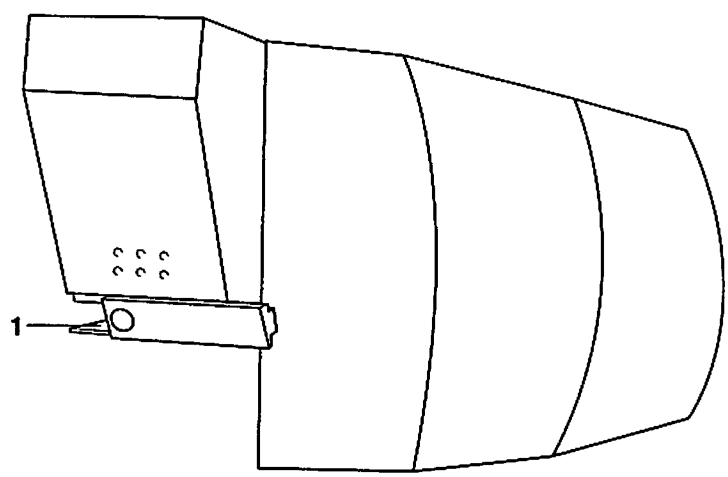
The AutomaticQC cartridge is self-contained and non-serviceable. It consists of the fluidic, electronic, and mechanical components needed to deliver QC material to the system's measurement components. The QC material is uniquely formulated to provide performance verification at several points in the clinical range of analytes measured by the Rapidpoint 400 series systems.

The AutomaticQC cartridge is mounted on the right side of the system where a support bracket secures it in place. The ampule breaker and an access panel must be removed before the cartridge is installed. Four standoffs attach the cartridge to the system where the ampule breaker was previously mounted.

AutomaticQC cartridges supply sufficient QC material to run at least three samples of each level three times per day for the life of the cartridge. Each cartridge is stable for 14 days after installation on the system. The system prompts the user when the cartridge needs to be replaced.

The cartridges must be stored refrigerated at 2 to 8°C.

AutomaticQC Cartridge Connector in the Open Position



1 Cartridge connector in the open position

AutomaticQC Cartridge Fluidic Components

The AutomaticQC cartridge contains the following fluidic components:

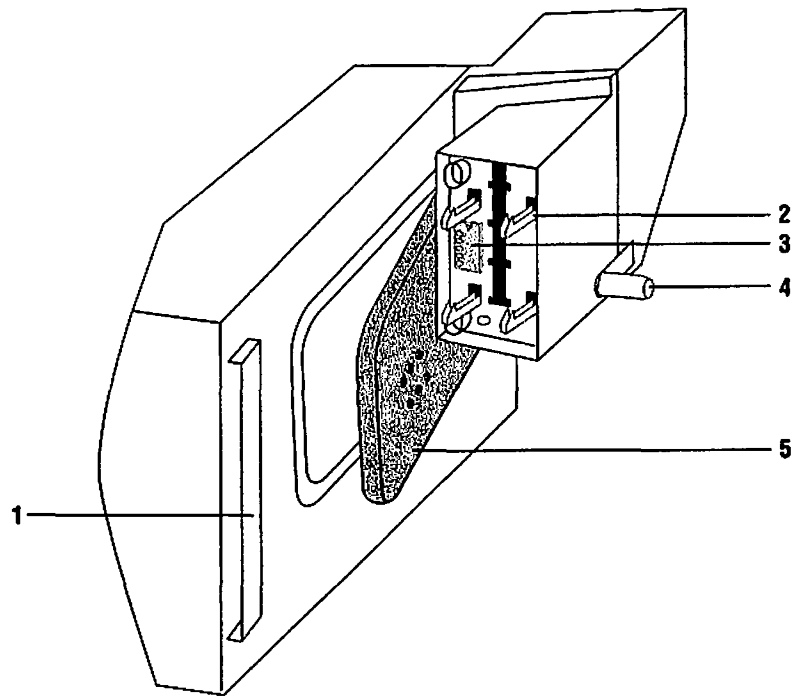
- valve assembly
- QC material
- tubing

The valve assembly consists of a sliding valve, valve seal, valve lubricant, and AutomaticQC probe.

The sliding valve is controlled by a stepper motor and a position detector system that moves the valve and accurately positions it using two position sensors. The valve has five positions, each of which enables one of the five QC reagents to be pumped through the stainless steel probe in the center of the valve. The probe remains stationary while the valve travels vertically about the probe to change the hydraulic path between the AutomaticQC cartridge and the measurement cartridge.

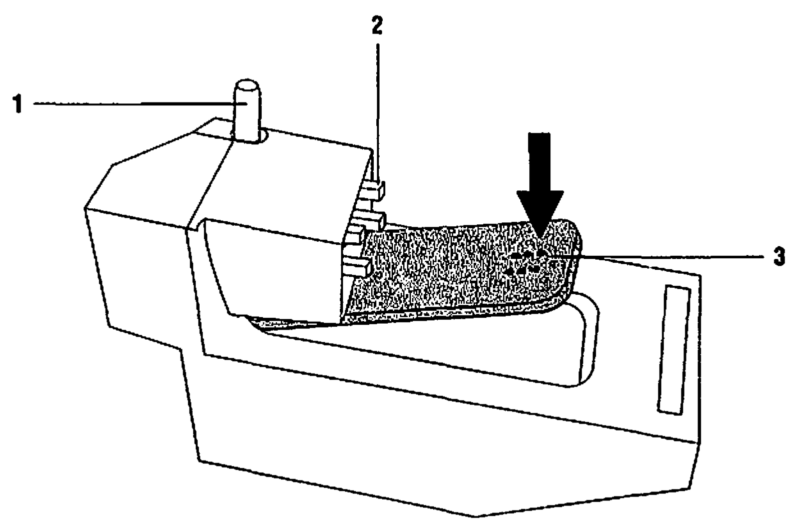
The QC material is supplied in five foil laminated bags, each of which holds one of five levels of QC material. Each bag is firmly secured in place with an inner and outer polystyrene clamp. Five nylon tubes, each of which connects one of the five bags to the valve assembly, serve as flow paths for the QC reagents.

AutomaticQC Cartridge



1 Bracket to secure the cartridge to the side of the system
2 Standoffs (4)
3 EEPROM
4 Cartridge connector
5 Cartridge Lever

AutomaticQC Cartridge Indicating Lever Closed Position



1 Cartridge connector
2 Standoffs (4)
3 Press Cartridge Lever to pierce reagent bags

The following table lists the contents of the AutomaticQC reagent bags:

Level	Volume	Ingredients
1	75 mL	buffered bicarbonate solution with Na^+, K^+, Ca^{++}, Cl^-, carbon dioxide, oxygen, nitrogen, dye, glucose, surfactant, and preservative
2	115 mL	buffered bicarbonate solution with Na^+, K^+, Ca^{++}, Cl^-, carbon dioxide, oxygen, nitrogen, dye, glucose, surfactant, and preservative
3	155 mL	buffered bicarbonate solution with Na^+, K^+, Ca^{++}, Cl^-, carbon dioxide, oxygen, nitrogen, dye, glucose, surfactant, and preservative
A	60 mL	buffered bicarbonate solution with Na^+, K^+, Ca^{++}, Cl^-, carbon dioxide, oxygen, nitrogen, surfactant, and preservative
B	60 mL	buffered bicarbonate solution with Na^+, K^+, Ca^{++}, Cl^-, carbon dioxide, oxygen, nitrogen, surfactant, and preservative

AutomaticQC Cartridge Interface

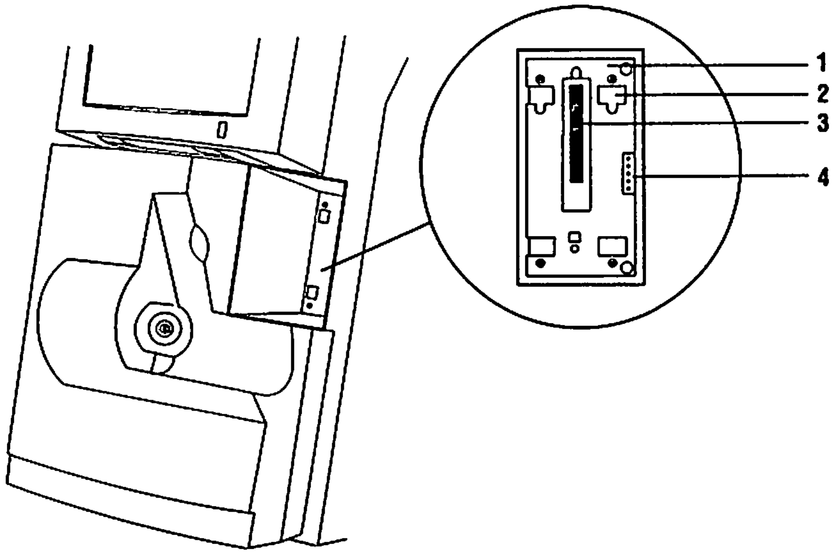
Removal of the ampule breaker and an access panel provides access to the latch assembly where the AutomaticQC cartridge connects to the system. A sliding metal latch plate in the latch assembly engages four standoffs on the AutomaticQC cartridge to secure the cartridge to the system.

A valve actuator that extends through the latch assembly moves the sliding valve on the AutomaticQC cartridge. Driven by a lead screw follower on the motor, the actuator moves until it engages a vertical slot in the sliding valve. The bidirectional stepper motor and position detectors move the valve along the probe to select the required fluid path for flow of QC material from the AutomaticQC cartridge to the measurement cartridge. The stepper motor has five stop positions.

With the AutomaticQC cartridge engaged to the system, the cartridge connector located on the front of AutomaticQC cartridge connects the AutomaticQC cartridge to the measurement cartridge. Fluidic connectivity between the two cartridges is provided by a single 0.5mm I.D. tube that passes from the base of the sliding valve in the AutomaticQC cartridge through the cartridge connector and into the measurement cartridge. The cartridge connector must be closed for the system to operate.

The AutomaticQC cartridge is disengaged from the system through a software procedure that causes the stepper motor to move the sliding metal latch plate and release the standoffs. If power is lost, the AutomaticQC cartridge can also be disengaged from the system by moving a release tab located beneath the stepper motor.

AutomaticQC Interface



1 Latch assembly

2 Locating holes (4)

3 Actuator

4 IDEE Pins

Mechanical Components

The AutomaticQC cartridge contains the following mechanical components:

- cartridge lever
- bag pierce pins
- cartridge connector

The cartridge lever is a spring-loaded panel that, when closed (flush with the AutomaticQC cartridge base plate), causes pins on its underside to actuate the pierce probes. The pierce probes engage fittings on the reagent bags to provide a seal and to puncture the bags to create fluid paths for the QC material to flow from the AutomaticQC cartridge to the measurement cartridge. A total of three pierce probes service the five bags. The AutomaticQC cartridge is shipped with the lever in its open position.

The cartridge connector is mounted on the front of the AutomaticQC cartridge. During installation of the cartridge, the connector is moved horizontally and connects with the measurement cartridge. It provides the sample path from the AutomaticQC cartridge to the measurement cartridge. The cartridge connector slide must be fully engaged for the AutomaticQC cartridge to function.

Electronic Components

The AutomaticQC cartridge contains the following electronic components:

- IDEE assembly
- microswitch

The IDEE assembly consists of a PC board and cable. An EEPROM chip on the PC board signals the system when the AutomaticQC cartridge is installed. The EEPROM chip also contains target ranges for each level of QC material in the cartridge. These ranges are automatically downloaded to the system when the AutomaticQC cartridge is installed. The cable connects the IDEE PC board to the cartridge connector microswitch.

The microswitch is located where the cable attaches to the bottom of the valve enclosure. It determines if the cartridge connector is open or closed.

Pumps

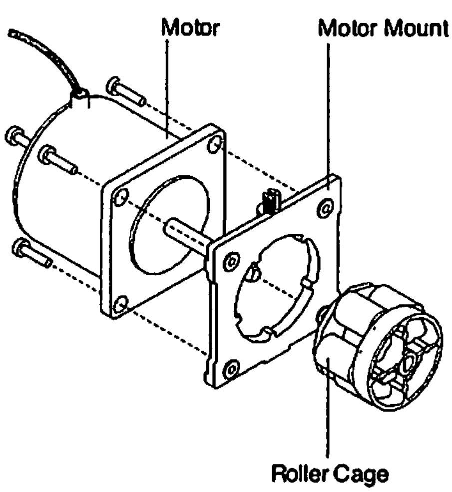
The pumps move the reagents, samples, and wash reagent through the Rapidpoint 400 series systems. The sample pump moves the sample and the reagents through the system. The sample pump also moves KCl through the reference electrode. The wash pump delivers a mixture of wash fluid and air to the sample entry port.

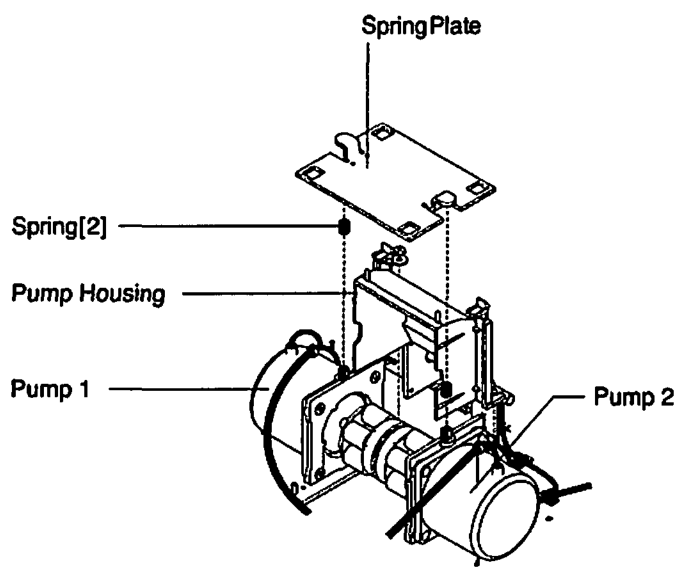
Each pump consists of a roller cage, a motor, a pump housing, a motor mount, a spring plate, and springs. The roller cage presses onto the motor shaft.

The pump that services the measurement cartridge generates flow by compressing the tubing against the fixed platen of the cartridge. As the individual rollers rotate through the platen area, a segment of the tubing is pinched in two places by adjacent rollers. The fluid is pushed through the tubing by the peristaltic action of the moving rollers.

A stepper motor drives each pump. Each motor moves 1.8 degrees per step and 200 steps per revolution. The electrical drive and control for the pump stepper motors are provided by a microstepping circuit on the main board. The software controls the speed and direction of each pump.

Stepper Motor Components





Display

The display is the user interface component of the Rapidpoint 400 series systems. The display tilts on a horizontal axis and locks at the chosen tilt. The display consists of the following components:

- display module
- liquid crystal display (LCD)
- touch screen
- printer
- display board
- display support

Display Module

The display module contains the LCD, the touch screen, the printer, the display board and the display support. In addition, the display module contains the roll of printer paper and the paper cover.

Liquid Crystal Display

The LCD is a 265 mm (10.4 inch) diagonal display with active matrix color LCD that provides 256 colors. The display supports an active matrix color LCD.

Touch Screen

The touch screen is overlaid onto the LCD. The touch screen consists of two electrically resistive sheets that are superimposed over the viewing area of the display. The sheets are separated from each other by a small air gap. When the screen is touched, the two sheets are electrically shorted. The resolution of the touch screen is determined by the control circuitry.

Printer

The built-in thermal-roll printer provides reports for calibrations, samples, and diagnostics.

The printer consists of a platen, a motor and gear mechanism, a thermal printhead, and two sensors. One sensor detects when the printhead is up and the other sensor detects when the printer is out of paper.

The printer is controlled by the display board. The printer cable carries the signals for the data, the motor control, the paper-empty sensor, and the printhead-up sensor. The display board communicates with the main board.

Display Board

The display board contains all the circuitry necessary to drive and control the LCD, the printer, and the touch screen. There are no service settings or jumpers on the display board.

Display Support

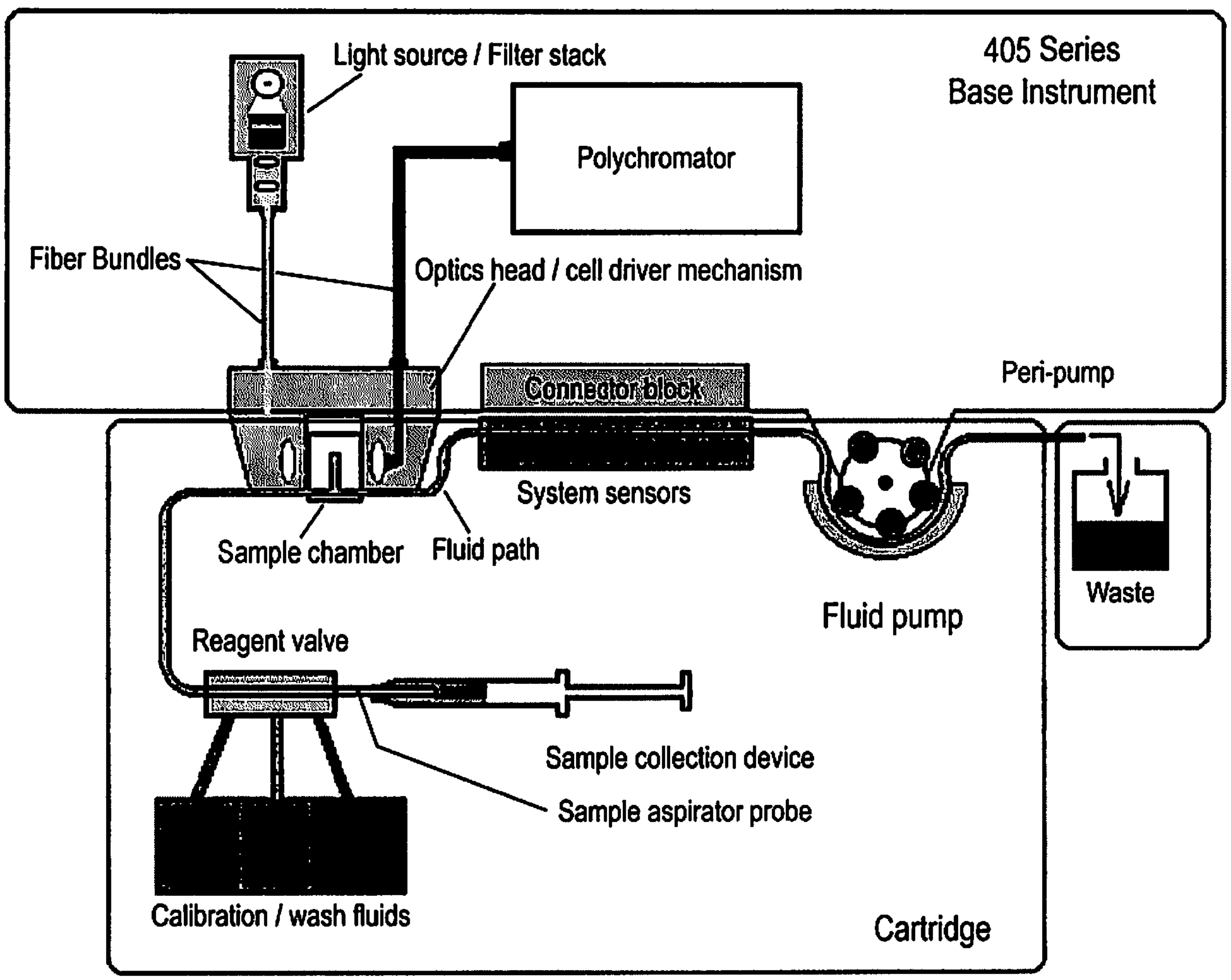
The display support holds the display to the system and the pawl provides stability through the stepped mechanism when the display is tilted into the varying tilt positions.

CO-oximeter Components

The Rapidpoint 405 system contains the CO-oximeter (CO-ox) measurement module that provides the capability for measuring the concentration of total hemoglobin and hemoglobin fractions (tHb, FO_2Hb, FHHb, FMetHb, FCOH) in whole blood samples.

Measurement occurs as the sample flows through the sample chamber. Light is transmitted, through a fiber bundle, to the optics head. As the sample flows through the sample chamber, the light is focused from one side of the optics head through the sample. The light is collected at the other side of the optics head and then is carried through a fiber bundle to the polychromator to be measured.

CO-ox Measurement System



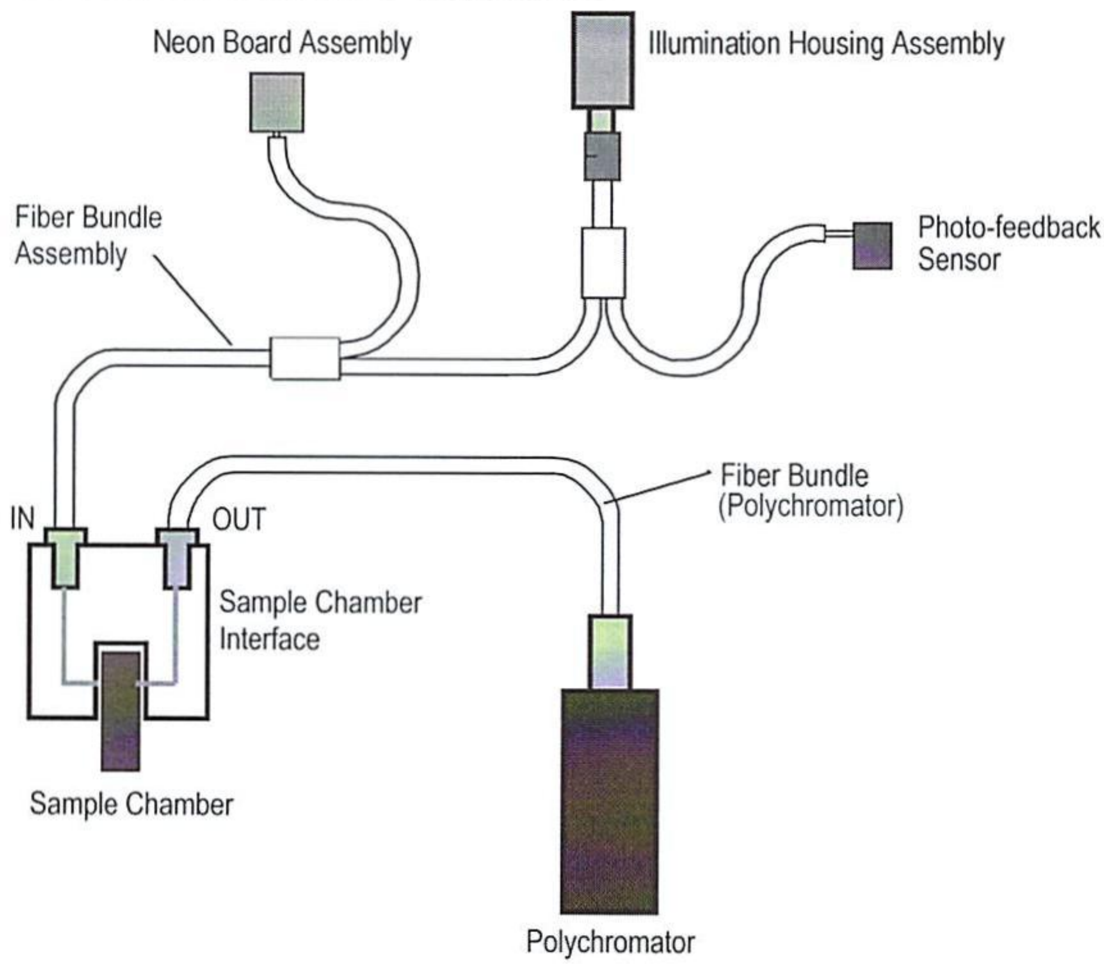
CO-ox Measurement Components

The Rapidpoint 405 system CO-ox components consist of the following:

- illumination housing assembly
- neon board assembly
- fiber bundle assembly
- sample chamber interface
- sample chamber
- polychromator module
- photo-feedback sensor

The CO-ox components are shown in the following figure.

Co-ox Measurement Components

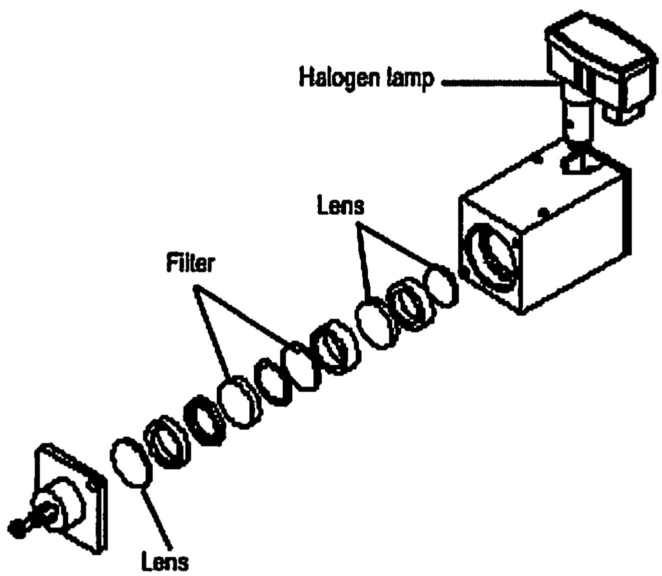


Illumination Housing Assembly

The CO-ox illumination housing assembly holds the replaceable halogen lamp. The housing contains optical filters that limit the lamp's output light (spectrum) to the visible range, and lenses that collect and focus light into the fiber bundle.

The lamp's output intensity is controlled by a closed-loop optical feedback system. This is accomplished by routing some of the output fibers from the fiber bundle, which is connected to the illumination housing assembly, to a photo-feedback sensor located on the main PB board. This sensor continuously monitors lamp output and generates a signal that regulates power to the lamp.

Illumination Housing Assembly



Neon Board Assembly

The neon board assembly contains a neon gas discharge lamp, lenses, a narrow bandpass interference filter, and a driver board. The output light (monochromatic) from this assembly is used as a reference to check the polychromator's wavelength measurement accuracy. This check occurs at the same time and frequency as the automatic tHb zero. Any optical or mechanical misalignment in the polychromator, which may cause wavelength measurement inaccuracies, are corrected during the zero calibration.

Fiber Bundle Assembly

The fiber bundle assembly contains many small diameter optical fibers that are combined to form a fiber optic cable with four terminals. The bundle connects to the neon board assembly, illumination housing assembly, sample chamber interface, and to the photo-feedback sensor on the main PC board.

The bundle transmits light to the CO-ox components during sample analysis.

- the fiber bundle transmits light from the illumination housing module to the optics head of the sample chamber interface, where it is focused onto the sample chamber
- transmits a small portion light from the illumination module to the photo-feedback sensor, which controls the halogen lamp output
- transmits light from the neon reference lamp to the sample chamber, which is used to check the polychromator's accuracy

NOTE: A separate fiber bundle is attached to the polychromator. This bundle, which is connected to one side of the optical head, transmits light from the sample chamber (originating from the neon lamp and from the halogen lamp) to the polychromator.

Sample Chamber Interface Assembly

The sample chamber interface assembly consists of the following components:

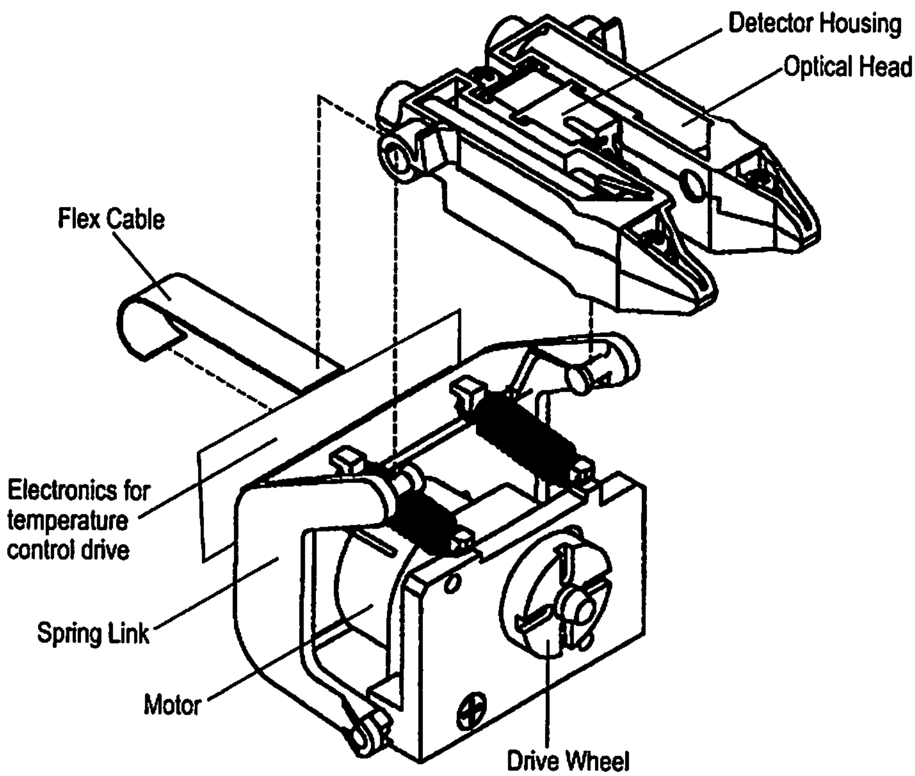
- optical head with spring link
- detector housing module
- motor
- drive wheel
- PC board

The optical head contains the optics that deliver light to and collect light from the sample chamber. The optical head houses four lenses, two mirrors, and the detector module.Two lenses and mirror direct the light from the fiber bundle onto the sample chamber. On the other side of the optical head another mirror and set of lenses collect the light that is not absorbed by the sample. A fiber bundle, connected from the optical head to the polychromator, relays the light for measurement. The spring link holds and locates the optical head.

The detector module uses a thermistor to ensure that the CO-ox sample chamber temperature is kept constant, and a flag detector system to detect the position of the sample chamber during measurement. The flag detector system consists of two emitters and two photo detectors that detect the position of the sample chamber.

The drive wheel is attached to the drive shaft of the motor, and engages a mechanism in the measurement cartridge that moves the sample chamber to the open and closed positions.

CO-ox Sample Chamber Interface

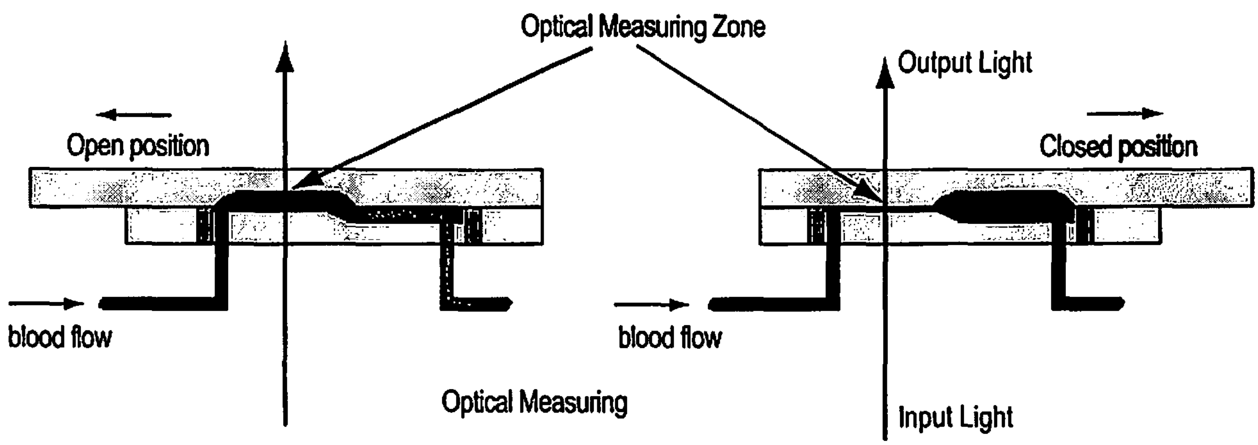


Co-ox Sample Chamber

The CO-ox sample chamber is part of the measurement cartridge.The sample chamber consists of the following components:

- base
- gasket
- seal
- shunt/flag
- sample chamber body
- spring
- cover
- heater chip

The sample chamber is in its measurement position when the motor moves the shunt into the closed position.



When the shunt returns to the open position, the measurement cartridge reagent system cleans the sample chamber. A heater chip ensures that the sample temperature is kept at 37 ± 0.3°C.

Polychromator Module

The polychromator module measures the intensities of light passed through the sample at a number of different wavelengths.

The polychromator module has the following components:

- fiber bundle
- diffraction grating
- grating imaging mirror
- collimating mirror
- diode array PC board
- polychromator PC board

The fiber bundle carries light collected by the optics head after passing through the sample and relays it to the polychromator. The fibers at the end of the fiber bundle form a line that defines the input slit to the polychromator.

The first mirror collimates light from the slit so that nearly parallel light falls on the diffraction grating. The diffraction grating disperses the light coming from the collimating mirror into its component wavelengths or colors. The second mirror images the light from the grating onto the photodiode array detector where the various wavelength intensities are measured.

The diode array board converts light into an electrical signal. The polychromator board converts the signal from the diode array board from an analog to a digital value for further processing.

Electronic System Overview

Overview

This section describes the electronic systems for the Rapidpoint 400 series systems. It provides circuit descriptions for each printed circuit board in the Rapidpoint 400 series systems. Each subsection is organized by board name and circuit description. Assembly drawings for each printed circuit board are included in *Replacing Parts*.

The electronic system directs the operation of all Rapidpoint 400 series systems components, including the fluidic system, the measurement system, and the sensors. It also receives information from these components regarding their various functions.

The electronic system performs all calculations required to determine reported parameters and controls the data communication with the devices connected to the Rapidpoint 400 series systems.

Electronic System

The Rapidpoint 400 series systems electronic system consists of the following PC boards:

- Contact
- Display
- Dualopto
- Main
- Main Interconnect
- Multiplexer
- UIP (User Interface Processor)

Contact PC Board

The Contact PC board amplifies signals from the electrodes before they are processed by the rest of the system. The Contact board provides the following:

- low bias, current-transimpedence output amplifiers and bias amplifiers for four amperometric sensors
- high-impedance differential amplifier for seven potentiometric sensors
- AC current, source and synchronous, differential amplifier for two hematocrit/fluid detector sensors
- connections for three thermistors organized in a thermal-control loop that regulate the sample temperature to +37°C
- connections to an EEPROM device located within the sensor module for storing calibration and configuration information specific to the measurement cartridge

Digital Signals

Digital Input Signals

Input Signal	Description
ID_SDA	Serial data line to the EEPROM located in the sensor module. This signal is bi-directional.
ID_SCK	Serial clock line to the EEPROM.
ASAMP	Control signal for the charge transfer process in the hematocrit circuits.
BSAMP	Control signal for the charge transfer process in the hematocrit circuits. The BSAMP signal is out of phase with the ASAMP signal.
DRIVE	This signal provides the AC excitation voltage for the hematocrit sensors.

Digital Output Signals

Output Signal	Description
ID_SDA	Serial data line to the EEPROM located in the sensor module. This signal is bi-directional.

Analog and Other Input Signals

Input Signal	Description
+5_VDC_HCT	Positive-power supply for the hematocrit circuits. Voltage is +5.00 V ±5% at 5 mA.
-5_VDC_HCT	Negative power supply for the hematocrit circuits. Voltage is -5.00 V ±5% at 5 mA.
+5_VDC_PO2	Isolated positive power supply for the oxygen circuit. Voltage is -3.5 ±0.5 V at 250 μA.
-5_VDC_PO2	Isolated negative power supply for the oxygen circuit. Voltage is +3.5 ±0.5 V at 250 μA.
5_RTN_PO2	Isolated power supply return for the oxygen circuit.
+5_VDC_GLU	Isolated positive power supply for the glucose circuit. Voltage is -3.5 ±0.5 V at 250 μA.
-5_VDC_GLU	Isolated negative power supply for the glucose circuit. Voltage is -3.5 ±0.5 V at 250 μA.
5_RTN_GLU	Isolated power supply return for the glucose circuit.
+5_VDC_LAC	Isolated positive power supply for the lactate circuit. Voltage is -3.5 ±0.5 V at 250 μA. For future use.
-5_VDC_LAC	Isolated negative power supply for the lactate circuit. Voltage is -3.5 ±0.5 V at 250 μA. For future use.
5_RTN_LAC	Isolated power supply return for the lactate circuit. For future use.
+5_VDC_CRE	Isolated positive power supply for the creatinine circuit. Voltage is +3.5 ±0.5 V at 250 μA. For future use.
-5_VDC_CRE	Isolated negative power supply for the creatinine circuit. Voltage is -3.5 ±0.5 V at 250 μA. For future use.
5_RTN_CRE	Isolated power supply return for the creatinine circuit. For future use.
REFV_PO2	Isolated +800 mV reference voltage for the oxygen electrode.
REFV_GLU	Isolated -400 mV reference voltage for the glucose electrode.
REFV_LAC	For future use.
REFV_CRE	For future use.
+5_VDC	Positive power supply for the potentiometric amplifiers. Supplies +5.00 V ±5% at 5 mA.

(Continued)

Input Signal	Description
-5_VDC	Negative power supply for the potentiometric amplifiers. Supplies -5.00 V ±5% at 5 mA.
ID_PWR	Power supply for the EEPROM in the sensor module. Supplies +5.00 V ±5% at 5 mA.
ID_RET	Power supply return signal for the EEPROM.
PO2_SIG	Current output signal of the pO_2 electrode.
GLU_WB	Current output signal of the glucose (active) electrode.
GLU_WA	Current output signal for an inactivated twin of the glucose electrode.
LAC_WB	For future use.
LAC_WA	For future use.
CRE_WB	For future use.
CRE_WA	For future use.
PH_VO	Voltage output signal of the pH sensor.
K_VO	Voltage output signal of the K^+ sensor.
CA_VO	Voltage output signal for the Ca^{++} sensor.
MG_CL_VO	Voltage output of the Cl- sensor.
NA_VO	Voltage output signal of the Na^+ sensor.
BUN_VO	For future use.
HCO3_VO	Voltage output signal of the HCO_3 sensor.
REF_VO	Voltage output signal of the reference sensor. The range is -60 to 140 mV. Impedance is about 10K ohms.
HCT1_HS	Signal output of the hematocrit 1 sensor. This sensor connects to the positive input of the synchronous sampling differential amplifier on the Contact board. The amplifier circuitry measures the impedance (conductance) between the HCT_HF and the HCT_LF contacts of the hematocrit 1 sensor.
HCT1_LS	Signal reference of the hematocrit 1 sensor. This sensor connects to the negative input of the synchronous sampling differential amplifier on the Contact board.

(Continued)

Input Signal	Description
HCT2_HS	Positive signal output of the hematocrit 2 sensor. This sensor connects to the positive input of the synchronous sampling differential amplifier on the Contact board. The amplifier circuitry measures the impedance (conductance) between the HCT_HF and HCT_LF contacts of the hematocrit 2 sensor.
HCT2_LS	Signal reference of the hematocrit 2 sensor. This sensor connects to the negative input of the synchronous sampling differential amplifier on the Contact board.
THM_BLK_HI	One terminal of the block thermistor.
THM_BLK_LO	The other terminal of the block thermistor.
THM_PRE_HI	One terminal of the preheater thermistor.
THM_PRE_LO	The other terminal of the preheater thermistor.
THM_SMP_HI	One terminal of the sample thermistor.
THM_SMP_LO	The other terminal of the sample thermistor.

Analog and Other Output Signals

Output Signal	Description
PO2_SIG	Amplified and buffered pO_2 sensor signal.
LAC_A	For future use.
LAC_B	For future use.
GLU_A	Amplified and buffered glucose (inactive) sensor signal.
GLU_B	Amplified and buffered glucose (active) sensor signal.
CRE_A	For future use.
CRE_B	For future use.
PH_SIG	Amplified and buffered pH sensor signal.
HCO3_SIG	Amplified and buffered HCO_3 sensor signal.
BUN_SIG	For future use.
K_SIG	Amplified and buffered K^+ sensor signal.
MG_CL_SIG	Amplified and buffered Cl- sensor signal.
NA_SIG	Amplified and buffered Na^+ sensor signal.
CA_SIG+	Amplified and buffered Ca^{++} sensor signal.

(Continued)

Output Signal	Description
REF_SIG	Amplified and buffered reference sensor signal.
HCT1_SIG	Amplified and buffered hematocrit 1 sensor signal.
HCT2_SIG	Amplified and buffered hematocrit 2 sensor signal.
THM_BLK_HI	The pass-through signal connected to one end of the block thermistor.
THM_BLK_LO	The pass-through signal connected to the other end of the block thermistor.
THM_PRE_HI	The pass-through signal connected to one end of the preheater thermistor.
THM_PRE_LO	The pass-through signal connected the other end of the preheater thermistor.
THM_SMP_HI	The pass-through signal connected to one end of the sample thermistor.
THM_SMP_LO	The pass-through signal connected to the other end of the sample thermistor.
PO2_RF	The voltage sensed internal to the pO_2 sensor.
PO2_CN	The voltage control electrode for the pO_2 sensor.
GLU_RF	The voltage sensed internal to the glucose sensor. The voltage is maintained at -400 mV ±4% and constant ±1 mV between calibration cycles with respect to 5_RTN_GLU.
GLU_CN	The voltage control electrode for the glucose sensor. The voltage adjusts such that the signal at GLU_RF is -400 mV with respect to 5_RTN_GLU.
LAC_RF	For future use.
LAC_CN	For future use.
CRE_RF	For future use.
CRE_CN	For future use.
HCT1_HS	The excitation signal for the hematocrit 1 sensor.
HCT1_LS	Signal return for the hematocrit 1 sensor.
HCT2_HS	The excitation signal for the hematocrit 2 sensor.
HCT2_LS	Signal return for the hematocrit 2 sensor.

(Continued)

Output Signal	Description
ID_PWR	Power supply for the EEPROM in the sensor module. It supplies +5.000 V ±5% at a current of 5 mA. This signal is generated on the Multiplexer board and is a pass-through to the sensor module.
ID_RET	Power supply return signal for the EEPROM. This is a pass-through signal from the Multiplexer board to the sensor module.

Circuit Description

Amperometric Circuits

Because the amperometric circuits (oxygen, glucose, lactate, and creatinine) are nearly identical, a description of only the glucose circuit is provided.

The glucose sensor connects to P1-5, P1-6, P2-5, and P2-6 on the Contact board. This sensor requires that a bias potential be forced to exist on P1-6, with respect to P1-5 and P2-6 of -400 mV.

Pin 1 of U9 forces a voltage on GLU_CN until the voltage sensed on GLU_RF equals REFV_GLU. The voltage on REFV_GLU is -400 mV, with respect to 5_RTN_GLU.

Limited by a diffusion rate, the electrode reaction dominates the current output. The concentration of glucose in the sample limits the diffusion rate, so that the output current is proportional to the glucose concentration in the sample.

Another current output, GLU_WA, is from the inactive electrode of the sensor. This current corrects the glucose signal current for interfering substances and for diagnostics. To prevent leakage currents from corrupting the electrode current output, the entire electrode current output net is guarded by 5_RTN_GLU.

NOTE: The oxygen sensor does not have an inactive output, so that circuitry is deleted.

Potentiometric Circuits

All the ion selective electrodes (ISEs) are potentiometric. Each ISE contains a membrane that isolates the electrode from the sample and that selectively passes the desired ion from the sample to the electrode. The change in potential difference between the ISE output voltage and the reference electrode output voltage is proportional to the logarithm of the concentration of the selected ion in the sample.

The eight amplifiers in U1 through U4 are configured as a differential amplifier, with the signal from the reference electrode subtracted from all the other signals. REF_VO connects to pin 5 of U4 through R23. R23 protects U4 from electrostatic discharge.

The feedback voltage at the inverting input of the respective amplifier completely guards each ISE output. This prevents leakage currents from corrupting the high impedance signal at the ISE output.

Hematocrit/Fluid Detector Circuits

The Contact board has two hematocrit/fluid detector circuits. These circuits are conductometric; that is, they measure the electrical conductance (resistance) of the fluid appearing between the HCT_HS and HCT_LS terminals. Because both circuits are nearly identical, a description of only the hematocrit 1 circuit is provided.

The signal labeled DRIVE is a +5V peak-to-peak square wave. R61 and C43 transforms this voltage into a current source with an amplitude of approximately 16.67 µA peak-to-peak at the same duty cycle and frequency as the DRIVE signal. This current is then applied to the sensor, and a differential voltage results between the HCT_HS and HCT_LS terminals from the excitation current flowing through the fluid.

The conductance (resistance) of the fluid in the sensor is determined using a known current and a measured voltage.

When the excitation current goes to its positive state, all of the switches are toggled. This action effectively disconnects C44 from ground and connects it to C23 instead. This connection allows the charge stored in C44, which represents the peak-to-peak voltage excursion at the HCT_HS terminal, to C23.

Simultaneously, a similar process is taking place with C16 and C21. U5 and feedback resistors R35 to 38 form a differential amplifier with a gain of 51. The HCT_SIG signal is the peak-to-peak voltage at HCT_HS minus the peak-to-peak voltage at HCT_LS multiplied by a gain of 51.

Hematocrit circuit 2 is identical to the circuit 1, except that C50, a capacitor AC, couples this hematocrit circuit to prevent a ground loop in the sample path.

Display PC Board

The Display PC board provides the electronics necessary to operate the following components:

- thermal printer
- touch screen
- liquid crystal display (LCD)
- speaker

In addition, the display board provides the following electrical functions:

- circuitry to provide diagnostic capability
- conversion of ASCII data from the host to actual printed reports
- detection, location, measurement, and reporting of touches on the touch screen
- generation of the voltage necessary to turn the LCD backlight on and off

Digital Signals

Digital Input Signals

Input Signal	Description
LCD_ENAB	Enables operation of the LCD.
LCD_DIM	Turns inverter (providing power to the LCD backlight) on and off.
LCD_DU0..7	Upper byte of LCD data signals.
LCD_DL0..7	Lower byte of LCD data signals.
LCD_YD	Control signal for the LCD. This signal indicates the start of a scan (analogous to a vertical sync signal).
LCD_LP	Control signal for the LCD. This signal indicates the start of a new line (analogous to a horizontal sync signal).
LCD_XCK	Clock signal for the LCD.
ENAVEE	Control signal. This signal enables the negative supply for the LCD.

(Continued)

Input Signal	Description
ENAVDD	Control signal. This signal enables the positive supply for the LCD.
LPT1DB<0..7>	Centronics type parallel port data bus.
LPT1STB-	The signal that indicates that valid data is present on LPT1DB<0..7>.
LPT1INIT-	The signal that initializes (resets) the printer control circuitry.
SPKR	Speaker input signal.
COM1TX	Serial port transmit signal. This signal receives data on the serial port.

Digital Output Signals

Output Signal	Description
LPT1ERROR-	Indicates that there is an error associated with the printer.
LPT1PE	Indicates that the printer is out of paper.
LPT1BUSY	Handshake signal. This signal indicates that the printer is currently busy and cannot accept any new data at this time.
LPT1ACK-	Handshake signal. This signal asserts when LPT1BUSY is becoming de-asserted.
LPT1SLCT	The signal that indicates that the printer is online.
PRN_DATA_IN	Data signal to the printer. Data is loaded into the printer in a serial fashion (much like loading a shift register).
PRN_CLOCK	The signal that indicates that valid data is available on the PRN_DATA_IN line.
PRN_LATCH-	The signal asserted to transfer the data from the shift register to the buffers that drive the thermal elements internal to the printer.
DST1..6	Thermal head strobe lines. These signals assert when data have been loaded into the print head to burn the data.

Analog Signals

Analog and Other Input Signals

Input Signal	Description
GND_PLANE	Ground reference signal for the electronics.
PWR_RET	Ground reference signal for the power devices (such as, printer, backlight, and inverter).
P24V	The +24 V supply voltage. This signal conforms to the requirements outlined in the *Digital Inputs Signals* section above.
VCC	Electronics 5 V power supply. This signal conforms to the requirements outlined in the *Digital Inputs Signals* section above.
POWER5V	Power device 5 V power supply. This signal conforms to the requirements outlined in the *Digital Inputs Signals* section above.
PAPER_OUT	The signal that indicates that the printer is out of paper. It is the open collector output of an optocoupler and requires a 100K ohms resistor pullup to the VCC line to operate. A paper-out condition is indicated by a voltage of greater than 2.5 V on this line.
HEAD_UP	The signal from the mechanical switch that is internal to the printer and that indicates the position of the print head. This signal is pulled up to VCC through a 10K ohms resistor. A voltage greater than 4.5 V indicates that the head is in the up position, and a voltage less than 0.2 V indicates that the head is in the down position.
PRN_TH_HI	The signal from the thermistor within the print head that determines the temperature of the print head.
TS_X+ and TS_X-	The two drive signals to the X axis on the touch screen. The TS_X+ signal connects through a switch to the VCC line. The TS_X- signal connects through a switch to ground.
TS_Y+ and TS_Y-	The two drive signals to the Y axis on the touch screen.

Analog and Other Output Signals

Output Signal	Description
POWER5V	Power device for the 5 V power supply that powers the printer motor. This signal conforms to the requirements outlined in the *Digital Inputs Signals* section above.
VCC	Electronics 5 V power supply. This signal conforms to the requirements outlined in the *Digital Inputs Signals* section above.
PRN_7V	Power supply signal for the print head. The voltage on this line is between 4.2 and 7.0 V, with the ability to supply from 0 to 10 amps of current.
GND_PLANE	Ground reference signal for the electronics.
PWR_RET	Ground reference signal for the power devices, such as printer, backlight, and inverter.
PHASE 1..4	Signals that drive the printer motor.
LED_DRIVE	Anode of the diode in the paper sensing optocoupler. This signal is pulled up to VCC through a 200 ohms resistor.
VCC	Electronics 5 V power supply. This signal conforms to the requirements outlined in the *Digital Inputs Signals* section above.
GND_PLANE	Ground reference signal for the electronics.
BL1..2	LCD backlight power supply voltage.

Circuit Description

Microcontroller and Peripheral Circuitry

U21, a 80C552 microcontroller, controls the thermal printer and the touch screen. This controller has a built-in, 10-bit ADC that measures diagnostic signals as well as determines touch locations on the touch screen.

U12, a 64-macrocell PLD, expands the input/output (I/O) capability of the microcontroller. This expanded I/O latches the data arriving at the parallel port and provides output latching to control the printer motor and the touch screen switches. It also includes latches for the lower address byte for accesses to RAM and ROM.

C45, C46, and U22, and U21 on-board oscillator circuit, make up the system clock. The nominal frequency (11.0592 MHz) facilitates the generation of the 9600-baud serial signal. U27 translates the serial signal from TTL to RS-232 signal levels and vice versa.

A µC monitor IC, U11, provides a reset pulse of at least 140 mS on power-up, power-down, and low-voltage brown-out conditions. In this configuration, it holds µC in reset when the +5 V power supply goes below approximately 4.65 V. U12 also uses this signal to hold its output latches in a known state until the µC has established control of the circuit.

U13, a 32K x 8 static RAM device, provides memory beyond what is available on the µC. This additional memory is intended for the downloadable font feature. U14, a 128K x 8 flash EEPROM device, is for program memory.

U10 is a power logic, octal, D-type latch.

Touch Screen Switches

Transistors Q2 to 9, along with their associated diodes, resistors, and capacitors, are the switches that interface with the touch screen.

DC-DC Converter Circuit

U19 is a synchronous-switching regulator controller that converts the +5 V power supply input to the display board to the +7 V power supply that powers the thermal printer. U20, R48 to 51, C29, and C39 form a +12 V regulator to power U19.

LCD Backlight Inverter Circuit

U15 is the module that provides the power to run the LCD backlight. The backlight typically requires a starting voltage of ~1100 V_{RMS} and a steady state voltage of ~500 V_{RMS} at a supply current of ~6-7 mA_{RMS}. U24 and its associated drive circuitry provide the ability to turn the backlight on and off.

Dualopto PC Board

The two Dualopto PC boards provide the luer position mechanism a way to determine where the valve actuator is located for the measurement and AutomaticQC valves. Two optical interrupter switches accomplish this task.

Sensor Circuit

All signals arrive from the main board through a 4-pin, male, IDC connector, J1. The two LEDs inside the interrupters, U1 and U2, connect in series and can be checked at test points TP3(+) and TP4(-) for a voltage of approximately 2.5V.

The output signals from each interrupter route to J1 and to test points TP1 (LUER_POS1) and TP2 (LUER_POS2), respectively. Their voltage levels are approximately 0.5V for the unblocked condition and approximately 4V for the blocked condition. All voltages are measured with respect to ground TP4.

Main PC Board

The Main PC board provides the following:

- system requirements for user interface processing
- real-time processing
- user/real-time first-in-first-out (FIFO) communications
- data acquisition
- control and utility functions

Real-Time Processor (RTP)

RTP 68332 Processor Circuitry

U47 is a 68332 32-bit microprocessor based on the 68000 core CPU32. It has additional functionality such as memory chips selects and extensive timer-counter functions.

The data bus, DR0 to DR15, has 32 bits internally and 16 bits externally. This bus is separated into a fast local bus for memory and a slower buffered bus for all other devices on the Main board.

The microprocessor uses a frequency synthesizer, Y1, for generating both its internal and external system clock.

U55 is a power supervisor and watchdog. The output pin 11 of the integrated circuit (IC) provides the microprocessor with a correctly generated, active low reset pulse. Pin 11 monitors the 5 V power on pin 15 and generates a reset if the voltage does not remain within the specified ±5% tolerance range. Pin 2 of IC U55 is the asynchronous active low reset input.

RTP 68332 Address and Data Bus Circuitry

The 68332 data bus, DR0 to DR15, is pulled up to VCC through resistor pack RN23. The exception is DR3, which is actively pulled to ground during RTP system reset by probe CR17.

Data bus, DM0 to DM15, is conditioned and passed to the memory section and to data bus drivers U49 and U58.

The address bus, named AM1 to AM19, is passed to the memory section and then to address latches inside U11. These latch a valid address on the falling edge of signal AS-. The address signals to these latches are pulled up by RN28, R235, R236, R237, and R238 to form the address bus A1 to A15. This address bus is then sent to address decoder CPLD U37.

DEBUG/XRAY connector J30 is an expansion connector that connects the main board to a diagnostic board.

RTP EPROM and PSRAM Circuitry

This section of the Main board contains the code memory EPROM and data memory PSRAM devices U57, U48, U56, and U41.

The data in the PSRAMs is volatile and is refreshed periodically by the 68332 TPU section.

RTP Address Bus Decoder and Memory Controller Complex Programmable Logic Device Circuitry

This section of the Main board contains a group of circuits located in the single complex programmable logic device (CPLD), U37. The majority of this IC takes the address bus signals A1 to A15, chip select signals CS9 to CS10 and other 68332 control signals, such as R/W, and forms various strobe signals that latch data in and out of U38.

Another function of U37 is to provide clock signal ADS_2 MHz for use by the main A/D converter. This clock is enabled only when the A/D converter busy signal is active.

U37 also arbitrates when a memory refresh cycle is needed by the PSRAMs U56 and U41 by responding to a refresh request from the 68332 TPU unit on pin 147 of U37. It responds by delaying the start of a normal memory request by inhibiting the pin 150 (DSACK1) signal. This delay causes the 68332 to insert wait states until the refresh cycle is completed.

The IC also enables and buffers all of the interrupt signals coming from the FIFO, A/D, debug and power-fail circuits. All outputs and the internal timing of U37 are synchronized to the 68332 master clock (RCLK1) on pin 139. All outputs on U37 become tri-state by pulling pin 140 to a high signal level.

RTP Data Bus I/O Latch CPLD Circuitry

This section of the Main board contains a group of circuits located in a CPLD, U38. The majority of the IC takes the data bus signals, D0 to D15 and strobe signals from U37 and other 68332 control signals, such as DS-, to latch data in and out of U38.

Latch outputs in the logic array block LAB-A direct data to the micro-stepper microcontroller U39.

Latch inputs in LAB-B direct data to the luer and AQC motor drivers.

Latch outputs in LAB-C and LAB-D direct data to the Multiplexer board assembly located in the measurement block module.

Latch outputs in LAB-E and LAB-F connect the system data bus (D0 to D15) to U37, and use the control strobes generated by U37.

Latch outputs in LAB-G and LAB-H receive data from the various system status sensors and flag signals from the FIFO circuitry.

Data Acquisition System (DAS) Front End Circuitry

This section of the Main board contains the interface to the Multiplexer board located in the measurement block module. This module receives parallel data bits from the U38 latches. U38 returns the properly conditioned sensor analog signal to the 40-pin connector J8. This connector returns the temperature sensor bridge signals for the preheater and block heater located in the measurement block module. J8 supplies +5 V, +12 V, and -12 V to the measurement block module.

The disposable cartridge connected to the measurement block module contains a small EE memory to retain information about the cartridge calibration and its history. This EE memory communicates to the Main board through J8.

There is a 12-bit digital-to-analog converter (DAC) IC U22 contained in this section of the DAS, and it sends a programmable analog voltage to the measurement block module to offset each sensor into proper calibration range. All the analog signals arriving at J8 are in a differential form and connected to two 16-channel multiplexers, U8 and U9. The MUX0-3 signals generated from latches on U38 control U8 and U9. The selected differential pair of signals is then sent to the next section.

DAS Analog-to-Digital Converter Circuitry

This section of the Main board contains the balanced low-pass filter that eliminates and averages noise received from the multiplexers, U8 and U9. The filter output is sent to IC U14. U14 is an instrumentation amplifier that converts differential signals to a single-ended signal.

The ADC IC U23 is a 16-bit converter. From the converter, the output is sent to U38 in a serial digital form. U38 converts the data from serial to parallel and sends it to the 68332 microprocessor.

The ADC IC U23 also needs a stable reference voltage to compare the unknown input voltage. Reference source U15 and buffer amplifier U16, along with significant filter capacitors, create an extremely stable 5 V source for the ADC.

DAS Fluid Detector Circuitry

This section of the Main board contains the circuitry from which the two analog fluid detector signals are monitored. The fluid detector signals are sent to a pair of comparators located in U17.

The non-inverting input pins of these comparators connect to a dual, 12-bit DAC, U24. The DAC allows the comparators to have programmable trip points, so each fluid detector has its own voltage level for comparison. The output of each comparator is sent to U12 as digital zero- or one-bit.

This section of the Main board also contains an eight-channel, single-ended multiplexer, U13, that monitors various system voltages, such as DAC heater temperatures and motor reference voltages.

RTP/UIP First In First Out (FIFO) Memory Communications Circuitry

This section of the Main board contains the circuitry that allows the user interface processor (UIP) and the RTP 68332 processor to communicate with each other. Communication occurs using two FIFO memories, U21 and U29. U21 and U29 are cross-coupled to each data path, which allows full communication in both directions. Status flags on both memories indicate to the microprocessors when the FIFOs are full or empty.

UIP Main Interconnect Board ISA Interface Circuitry

This section of the Main board contains the circuitry to connect the UIP processor to the Main board through the Main Interconnect board. The connection is through a 98-pin industry standard architecture (ISA) connector, J1.

UIP Display Module, COM1, COM2/LPT1, and Utility Circuitry

This section of the Main board contains the signals to connect the UIP processor to the Main board through various cables. Connector J16 contains the COM1 serial port signals. These signals originate on the UIP Processor board and exit the Main board through J6. This Main board section controls the touch panel on the display module assembly.

Connector J19 contains the COM2 serial port signals. These signals originate on the UIP Processor board and exit the Main board through 20-pin connector, J2. This provides the LIS communications port on the Rear Interconnect board assembly.

Connector J19 also contains the LPT1 parallel port signals. These signals originate on the UIP Processor board and exit the Main board through J6. This circuit transmits data to the thermal printer on the display module assembly.

The utility connector, J17, on the UIP Processor board utility allows the power supply to warn the board of an impending power failure through signal PWRFAILX-. This connector also allows the onboard speaker signal to exit the Main board through J6 on its way to the speaker located behind the LCD on the display module assembly.

Connector J18 is the UIP Processor board flat panel interface. J18 sends an upper and lower data byte and control signals to the LCD through series resistor terminators RN9 and RN25.

UIP COM3 Circuitry

This section Main board contains an IC U36, which is a USART. The U36 allows the UIP Processor board to have a third RS-232C serial port. This IC 16C550 is a standard PC compatible component and has full modem signals with programmable baud rates to 19,200 kilobaud.

IC U33 takes the 0 to 5 V levels from the USART and converts them to ±7 V signals following RS-232C standards. This serial port is used to connect a bar code reader to the instrument. The connector, J2, is the interface between the Main board and the Rear Interconnect board located at the back of the instrument.

UIP ISA Address Bus Decoder, Data Bus I/O Latch CPLD, and Communications Circuitry

This section Main board contains an IC U20, which is a CPLD. The IC U20 allows expansion of the UIP Processor board using the ISA bus connector.

The LAB-A of the IC inputs the UIP address bus signals, A0 to A9, along with other ISA control signals such as IOW- and IOR-, to form various chip select for the other peripherals on the ISA bus.

The LAB-B of IC U20 takes the data bus signals, USD0 to USD3, in and out, as well as inputs for the FIFO status flags and door and waste switch signals.

The LAB-C decodes chip selects for the Controller IC and serial port COM3.

The LAB-D decodes chip selects for FIFO memory interface and buffers interrupt signals from the FIFO and door/waste switches.

IC U12 takes parallel UIP data and converts it to serial bus protocol.

Control Micro-stepper Processor, and Sample and Wash Pump Driver Circuitry

This section Main board contains an 87C52 microcontroller, IC U27. The IC U27 formats data for micro-stepping DAC ICs, U10 and U18. These two ICs take digital sine and cosine wave data and convert them to analog voltage reference signals for the power ICs, U4 and U11. These components work together to give the Main board the ability to drive two 23-frame size stepping motors. The wash pump motor and the sample pump motor interfaces through connector J3.

Control Heater DAC, Driver Circuitry, and Valve Driver Circuitry

This section Main board contains IC U25, which is an AD7247 dual DAC. This IC takes digital data from the 68332 and creates two analog voltages with a resolution of 12 bits. These heater voltages are sent to operational amplifier U54, which multiplies the voltage by four and drives power transistors Q4 and Q3.

Section A of DAC IC is for the block heater and section B is for the preheater. These signals leave the Main board on connector J7 and are sent to the heater resistance pads on the measurement block assembly. Thermistor R229 is mounted near the power transistor heatsinks and monitors for failures such as air flow restrictions). When R229 detects a failure, it notifies the DAS section.

This section Main board also contains IC U28, which takes digital latched signals from RTP CPLD U38 and forms the proper sequencing signals to drive the luer position motor located in the equipment wall module. These driver signals exit the Main board through J3.

Power System Status Circuitry, Diagnostic LEDs, and Switches

This section Main board contains the MC34161 power supply monitors: ICs U39, U40, and U43. These ICs are voltage window comparators, which verify if the ±12 and +24 V power supplies are within the rated tolerance. The 68332 reads signals ±12 V_STS and +24 V_STS from the RTP data bus through transparent latch U12.

This section Main board also contains IC U44, which is a dual comparator that checks the motor power supply. U44 ensures that motors are operational by measuring the voltage drop across resistors R188. The 68332 reads signals MOTOR_STS from the RTP data bus through transparent latch U38.

This section Main board has eight diagnostic light-emitting diodes (LEDs), CR2 to CR9, that are latched by U59 onto the RTP data bus. There is also an eight position dip switch, SW1, which is read by the RTP data bus through transparent latch U50.

Control Automatic Quality Control (AQC) Valve Stepper Circuitry

This section Main board contains IC U32, which takes digital latched signals from RTP CPLD U38 and forms the proper sequencing signals to drive the automatic quality control (AQC) position motor that will be located in the AQC module. The driver signals exit the Main board through connector J4. This connector also provides +5 V power and dualopto signals for the AQC module.

Power System Protection and Input Circuitry

This section Main board contains the 24-pin connector, J25. This connector delivers all power supply voltages from the system power supply.

Power Supply Voltage	Description
+12_VDC supply	Overvoltage protected by transient protector U42 and is current limited from shorts by R174.
-12_VDC supply	Overvoltage protected by transient protector U51 and is current limited from shorts by R173.
+5_VDC supply	Overvoltage protected by transient protector U52 and is current limited from shorts by R243, R218, R244.
VCC supply	Overvoltage protected by transient protector U52 and is current limited from shorts by R243, R218, R244.
AUX5V supply	Overvoltage protected by transient protector U52 and is current limited from shorts by R245.
DIS5V supply	Drives the thermal printer print head and is current limited from shorts by R196, R195, and R230.
DISVCC supply	Drives the logic ICs in the display module and is current limited from shorts by R2.
BKLTVCC supply	Drives the backlight inverter in the display module and is current limited from shorts by R41.
J24 floppy power connector	Drives the diskette drive on the main assembly and is current limited from shorts by R1.

Transient protector U59 protects the +24 V supply from overvoltage. The +24 V supply is current limited from shorts by fuse F2. This supply drives motors through diode U53, which clamps the motor current monitoring circuit to 0.2 V. This supply also splits to drive heaters through power transistor.

Signal HEAT24V_EN controls power to the heaters and is enabled by a latched bit on IC $\overline{U38}$ on the RTP data bus. LEDs CR10 to CR13 indicate which of the four power supply voltages (VCC, +12 V, -12 V, and +24 V) is present.

UIP Main Interconnect Board ISA Interface

Digital Input Signals

Input Signal	Description
+12_VDC	+12 VDC from the power supply.
-12_VDC	-12 VDC from the power supply.
+5_VDC	+5 VDC from the power supply.
GND	Ground return for the +5 VDC to the power supply.
DRQ0-DRQ3 DRQ5-DRQ7	DMA requests. These signals are asynchronous channel requests used by peripheral devices and a microprocessor to gain DMA service or control of the system.
I/OCHCK	I/O channel check. This signal provides the system board with parity (error) information about memory or devices on the I/O channel.
I/OCHRDY	I/O channel ready. A memory or I/O device pulls this signal low to lengthen I/O or memory cycles.
I/OCS16-	I/O 16-bit chip select.
IRQ3-IRQ7 IRQ9-IRQ12 IRQ 14, IRQ15	Interrupt request lines. These lines signal the microprocessor when an I/O device requires attention. An interrupt request is generated when an IRQ line is raised from low to high. The line is high until the microprocessor acknowledges the interrupt request.
Master-	Signal used with DRQ to gain system control.
MEMCS16-	Memory 16-bit chip select.
0WS	Zero wait-state. This signal directs the microprocessor to complete the present bus cycle without inserting any additional wait cycles.

Digital Output Signals

Output Signal	Description
AEN	Address enable. This signal disconnects the microprocessor and other devices from the I/O channel and enables DMA transfers.
BALE	Buffered address latch enable. This signal originates from the bus controller and is used on the system board to latch valid addresses and memory decodes from the microprocessor.

(Continued)

Output Signal	Description
CLK	8-MHz system clock.
DACK0- to DACK3- DACK5- to DACK7-	Used to acknowledge DMA requests. These signals are active low.
RESETDRV	Resets or initializes system logic at power up or during a low voltage condition. This signal is active high.
OSC	Oscillator. This signal is a high speed clock with a 70-nS period (14.31818 MHz) and is not synchronous with the system clock. It has a 50% duty cycle.
SMEMR-	Instructs the memory devices to drive data onto the data bus. SMEMR- is active only when the memory decode is within the low 1M of memory space. SMEMR- is derived from MEMR- and the decode of the low 1 MB of memory. This signal is active low.
SMEMW-	Instructs the memory devices to store the data present on the data bus. SMEMW- is active only when the memory decode is within the low 1 MB of the memory space. SMEMW- originates from MEMW- and the decode of the low 1 MB memory. This signal is active low.
T/C	Terminal count. This signal provides a high pulse when the terminal count for any DMA channel is reached.

Digital Bi-directional Signals

Bi-directional Signals	Description
IOR-	I/O Read signal. This signal instructs an I/O device to drive its data onto the data bus. The system microprocessor or DMA controller, or a microprocessor or DMA controller resident on the I/O channel, drives the signal. This channel is active low.
IOW-	I/O Write signal. This signal instructs an I/O device to read the data from the data bus.
LA17-LA23	Unlatched signals address memory and I/O devices.
MEMR-	Instructs the memory devices to drive data onto the data bus.
MEMW-	Instructs the memory devices to store the present data onto the data bus.
REFRESH-	Indicates a refresh cycle. This signal is driven by a microprocessor on the I/O channel and is active low.

(Continued)

Bi-directional Signals	Description
SA0-SA19	Address signals 0 to 19 are used to address memory and I/O devices.
SBHE	System bus high enable.
SD0-SD15	Provides data bus bits 0-15 for the microprocessor, memory, and I/O devices.

UIP COM1 Interface

Digital Input Signals

Input Signals	Description
COM1RX	Transmit signal for the touch screen serial port to the UIP Processor board from the Main board.
COM1CTS	Clear to send signal for the touch screen serial port from the UIP Processor board to the Main board.

Digital Output Signals

Output Signal	Description
COM1TX	Transmit signal for the touch screen serial port from the UIP Processor board to the Main board.
COM1RTS	Ready to send signal for the touch screen serial port to the UIP Processor board from the Main board.

UIP COM2/LPT1 Interface

Digital Input Signals

Input Signal	Description
COM2RX	Transmit signal for the serial port to the UIP Processor board from the Main board.
COM2CTS	Clear to send signal for the LIS serial port to the UIP Processor board from the Main board.
COM2DSR	Data set ready signal for the LIS serial port to the UIP Processor board from the Main board.
COM2DCD	Data carrier detect signal for the LIS serial port to the UIP Processor board from the Main board.
COM2RI	Ring indicator signal LIS serial port to the UIP processor from the Main board.
LPT1ERROR	Printer error. Possible error sources are print head temperature out of range, print head voltage out of range, print head in the up position, or printer out of paper.
LPT1PE	Printer is out of paper.
LPT1BUSY	Printer is currently busy and cannot accept any new data at this time.
LPT1ACK	Signal that is asserted when LPT1BUSY is becoming de-asserted.
LPT1SLCT	Printer is online.

Digital Output Signals

Output Signal	Description
COM2TX	Transmit signal LIS serial port from the UIP Processor board to the Main board.
COM2RTS	Ready to send signal for the LIS serial port from the UIP Processor board to the Main board.
COM2DTR-	Data terminal ready signal for the LIS serial port from the UIP Processor board to the Main board.
LPT1DB<0..7>	Centronics-type parallel port.
LPT1STB	Valid data on LPT1DB<0..7>.
LPT1INIT	Initializes printer control circuitry.

Flat Panel Interface

Digital Output Signals

Output Signal	Description
LCD_ENAB	Enables operation of the LCD.
LCD_DIM	Turns the LCD backlight inverter on and off.
LCD_DU0..7	Upper byte of LCD data signals.
LCD_DL0..7	Lower byte of LCD data signals.
LCD_YD/VSYNC	LCD frame start signal.
LCD_/HSYNC	LCD line start signal.
LCD_XCK/CK	LCD clock signal.
ENAVEE	LCD negative supply control signal.
ENAVDD	LCD positive supply control signal.

UIP Utility Interface

Digital Input Signals

Input Signal	Description
PWRFAILX-	Active low signal from the Main board to the UIP processor that indicates a system power failure.
RESET-	Active low signal from the Main board to the UIP processor that indicates a system restart.

Digital Output Signals

Output Signal	Description
SPKR	Audio output signal from the UIP Processor board to the Main board.

Display Board Interface

Digital Input Signals

Input Signal	Description
LPT1ERROR	Printer error. Possible error sources are print head temperature out of range, print head voltage out of range, print head in the up position, or printer out of paper.
LPT1PE	Printer is out of paper.
LPT1BUSY	Printer is currently busy and cannot accept any new data at this time.
LPT1ACK-	Signal asserted when LPT1BUSY is becoming de-asserted.
LPT1SLCT	Printer is online.

Digital Output Signals

Output Signal	Description
LCD_ENAB	Enables operation of the LCD.
LCD_DIM	Turns the LCD backlight inverter on and off.
LCD_DU0..7	Upper byte of LCD data signals.
LCD_DL0..7	Lower byte of LCD data signals.
LCD_YD/VSYNC	LCD frame start signal.
LCD_/HSYNC	LCD line start signal.
LCD_XCK/CK	LCD clock signal.
ENAVEE	LCD negative supply control signal.
ENAVDD	LCD positive supply control signal.
LPT1DB<0..7>	Centronics-type parallel port data bus.
LPT1STB	Indicates valid data on LPT1DB<0..7>.
LPT1INIT-	Initializes the printer control circuitry.
SPKR	Speaker input signal.
COM1TX	Transmit signal for the touch screen serial port to the Display board from the Main board.
COM1CTS-	Clear to send signal for the touch screen serial port.

Multiplexer Board Interface

Digital Input Signals

Input Signal	Description
PREMUX_SIG_HI	Multiplexed sensor signal, offset adjusted and properly amplified output of the Multiplexer board.
PREMUX_SIG_LO	Signal low sense return for PREMUX_SIG.
THM_BLK_HI	Connected to the reference side of the bridge. Typical voltage is +595.9 mV.
THM_BLK_LO	High terminal of the block thermistor.
THM_PRE_HI	Connected to the reference side of the bridge. Typical voltage is +595.9 mV.
THM_PRE_LO	High terminal of the preheater thermistor.
HCT1_SIG	Output of the first hematocrit circuit. This signal originates on the Contact board and passes through the Multiplexer board on its way to the DAS circuitry.
HCT2_SIG	Output of the second hematocrit circuit. This signal originates on the Contact board and passes through the Multiplexer board on its way to the DAS circuitry.

Digital Output Signals

Output Signal	Description
PREMUX0..7	8-bit latched bus.
GAIN0..5	6-bit latched bus.
ID_SDA	Serial data line to the EEPROM located in the sensor module. It is a bi-directional signal.
ID_SCK	Serial clock line to the EEPROM.

Analog and Other Output Signals

Signal	Description
DAC_HI	12-bit binary D/A signal from the DAS circuitry.
DAC_LO	Signal return line for the DAC signal.
VREF	+5 V measurement system voltage reference from the DAS circuitry.
+12_VDC	+12 VDC from the filtered supply.
-12_VDC	-12 VDC from the filtered supply.
12_RET	12 VDC ground return from the filtered supply.
+5_VDC	+5 VDC from the filtered supply.
5_RTN	5_VDC ground return from the filtered supply.

Main Interconnect PC Board

The Main Interconnect PC board provides the ISA bus interface from the UIP Processor board to the Main board.

ISA Connectors

All the ISA bus signals are sent from the UIP Processor board through a 98-pin female edge connector (J1). This connector routes all signals to the Main board through 98-pin male edge connector (P1). This board is of multilayer construction and includes power and ground on these layers.

Multiplexer PC Board

The Multiplexer PC board selects amplified electrode signals for the Contact board, adds a programmable offset and gain, and sends the resulting high-level signal to the Main board for digitizing. The Multiplexer board provides the following:

- four galvanically isolated, dual-channel amperometric circuits with precision bias voltage
- a precision reference bridge and amplifier for the sample temperature thermistor
- 32-channel multiplexer and programmable gain/offset circuit
- oscillator circuit to generate control signals for hematocrit circuits
- conditioning circuits for the Contact board power supply
- input circuit for the block and preheater thermistors

Digital Signals

Digital Input Signals

Input Signal	Description
ID_SDA	Serial data line to the EEPROM located in the sensor module. It is a bi-directional signal.
ID_SCK	Serial clock line to the EEPROM.
ASAMP	Control signal manages the charge transfer process in the hematocrit circuits.
BSAMP	Control signal manages the charge transfer process in the hematocrit circuits.
DRIVE	Signal provides the AC excitation voltage for the hematocrit sensors.

Digital Output Signals

Output Signal	Description
PREMUX0..7	8-bit bus driven by the DAS circuitry and received by the Multiplexer board.
GAIN0..5	6-bit bus driven by the DAS circuitry and received by the Multiplexer board.
ID_SDA	Serial data line to the EEPROM located in the sensor module. It is a bi-directional signal.
IDA_SCK	Serial clock line to the EEPROM.
POLAR_ENAB	Signal enables/disables the polarization bias voltages to all the amperometric circuits.

Analog Signals

Analog and Other Input Signals

Input Signal	Description
DAC_HI	The 12-bit binary D/A signal from the DAS circuitry.
DAC_LO	Signal return line for the DAC signal.
VREF	+5 V measurement system voltage reference from the DAS circuitry.
+12_VDC_PM	+12 VDC from the DAS circuitry. See the *Digital Signals* section for details.
-12_VDC_PM	-12 VDC from the DAS circuitry. See the *Digital Signals* section for details.
12_RET_PM	12 VDC ground return from the DAS circuitry. See the *Digital Signals* section for details.
+5_VDC_PM	+5 VDC from the DAS circuitry. See the *Digital Signals* section for details.
5_RET_PM	5 VDC ground return from the DAS circuitry. See the *Digital Signals* section for details.
HCT1_SIG	Output of the first hematocrit circuit. This signal originates on the Contact board and passes through the Multiplexer board on its way to the DAS circuitry.
HCT2_SIG	Output of the second hematocrit circuit. This signal originates on the Contact board and passes through the Multiplexer board on its way to the DAS circuitry.
PO2_SIG	Amplified and buffered pO_2 signal.
GLU_A_SIG	Amplified and buffered signal from the glucose inactive electrode.
GLU_B_SIG	Amplified and buffered signal from the glucose active electrode.
LAC_A_SIG	Signal is not used.
LAC_B_SIG	Signal is not used.
CRE_A_SIG	Signal is not used.
CRE_B_SIG	Signal is not used.
HCO3_SIG	Amplified and buffered HCO_3 sensor signal.
PH_SIG	Amplified and buffered pH sensor signal.

(Continued)

Input Signal	Description
BUN_SIG	Signal is not used.
K_SIG	Amplified and buffered K^+ sensor signal.
MG_CL_SIG	Amplified and buffered Cl^- sensor signal.
NA_SIG	Amplified and buffered Na^+ sensor signal.
CA_SIG	Amplified and buffered Ca^{++} sensor signal.
REF_SIG	Amplified and buffered reference sensor signal.
THM_BLK_LO	High terminal of the block thermistor.
THM_PRE_LO	High terminal of the preheater thermistor.
THM_SMP_LO	High terminal of the preheater thermistor.

Analog and Other Output Signals

Output Signal	Description
+5_VDC_HCT	Positive power supply for the hematocrit circuits.
-5_VDC_HCT	Negative power supply for the hematocrit circuits.
+5_VDC_PO2	Isolated positive power supply for the oxygen circuit.
-5_VDC_PO2	Isolated negative power supply for the oxygen circuit.
5_RTN_PO2	Isolated power supply return for the oxygen circuit.
+5_VDC_GLU	Isolated positive power supply for the glucose circuit.
-5_VDC_GLU	Isolated negative power supply for the glucose circuit.
5_RTN_GLU	Isolated power supply return for the glucose circuit.
+5_VDC_LAC	Isolated positive power supply for the lactate circuit. For future use.
-5_VDC_LAC	Isolated negative power supply for the lactate circuit. For future use.
5_RTN_LAC	Isolated power supply return for the lactate circuit. For future use.
+5_VDC_CRE	Isolated positive power supply for the creatinine circuit. For future use.
-5_VDC_CRE	Isolated negative power supply for the creatinine circuit. For future use.
5_RTN_CRE	Isolated power supply return for the creatinine circuit. For future use.

(Continued)

Output Signal	Description
REFV_PO2	Isolated +800 mV reference voltage for the oxygen electrode.
REFV_GLU	Isolated -400 mV reference voltage for the glucose electrode.
REFV_LAC	For future use.
REFV_CRE	For future use.
+5_VDC	Positive power supply for the potentiometric amplifiers.
-5_VDC	Negative power supply for the potentiometric amplifiers.
ID_PWR	Power supply for the EEPROM in the sensor module.
ID_RET	Power supply return signal for the EEPROM.
PREMUX_SIG_HI	Multiplexed sensor signal, offset adjusted and properly amplified output of the Multiplexer board.
PREMUX_SIG_LO	Signal low sense return for PREMUX_SIG.
THM_BLK_HI	Signal connected to the reference side of the bridge.
THM_BLK_LO	High terminal of the block thermistor.
THM_PRE_HI	Signal connected to the reference side of the bridge.
THM_PRE_LO	High terminal of the preheater thermistor.
THM_DOR_HI	Signal is not used.
THM_DOR_LO	Signal is not used.
HCT1_SIG	Output of the first hematocrit circuit. This signal originates on the Contact board and passes through the Multiplexer board on its way to the DAS circuitry.
HCT2_SIG	Output of the second hematocrit circuit. This signal originates on the Contact board and passes through the Multiplexer board on its way to the DAS circuitry.

Circuit Descriptions

Amperometric Isolation Circuits

There are four isolation circuits on the Multiplexer board for the four amperometric channels (oxygen, glucose, lactate, and creatinine).

Digital Control Circuit

R27 and C54, along with three of the inverters from U14, form an oscillator (approximate frequency of 20 kHz) that drives a state machine formed by U15, U21, U22, and U27. This state machine produces all of the signals necessary to operate the amperometric and hematocrit circuits.

Temperature Circuits

A thermistor that is connected thermally to the sample path senses the sample temperature. This resistance is converted into a voltage measured by the DAS circuitry on the Main board.

Additionally, it is necessary to monitor the temperature of the connector block and the sample preheater. This monitoring is accomplished with two 29.07K ohms thermistors: the block and the preheater thermistors.

Programmable Gain Amplifier Circuitry

To optimize the dynamic range offered by the ±5 V A/D converter on the Main board, it is necessary to adjust the offset voltage and set the gain of each signal before it is cabled down to the Main board.

U20 buffers the DAC_PGA offsetting signal and drives the bottom of the gain resisting network for U17.

User Interface Processor PC Board

The UIP board is an Intel Pentium 166 MHz MMX 0.25 micron microprocessor with a 352-ball HL-PBGA package and includes the following components:

- Intel 82439TX NTXC chip, providing support for

  L2 cache

  DRAM

  CPU-to-PCI bridge

- 512 KB write-back L2 cache supporting pipelined burst SCRAM
- 128 MB of 3.3 V SDRAM in a single 144-pin SODIMM socket
- Intel 82371EB (PIIX4E) PCI to ISA/IDE Xcelerator, providing support for

  IDE controller with primary channel routed to 2.5 inch hard drive interface. Primary channel supports Master/Slave IDE devices

  Interrupt controller

  Timer/counters

  DMA controller

  Real-time clock (RTC)

  ISA bus interface

- 512 KB of boot-block Flash memory (FBD) to store BIOS
- C and T 69000 PCI SVGA Controller with 2 MB embedded SDRAM memory. This controller enables simultaneous output to a CRT and a flat panel.

  TTL flat panel interface to support existing panels

  PanelLink flat panel interface buffers that reduce cabling and high frequency emissions.

  Analog RGB and sync signals to support analog displays

  BIOS driver for Sharp LQ10D367, LM64P8989, and NEC 6448AC33-18 flat panels

- Intel 82559 PCI Ethernet controller supporting 10BaseT or 100BaseTX
- Super I/O controller to provide support for the following:

  Floppy disk controller

  two full PC-compatible RS-232 serial ports

  one PC-compatible parallel port

  Keyboard and mouse controller
- Sound Blaster compatible audio circuitry
- Battery-backed real-time clock
- +5 volt only input power requirement
- onboard 1.8 to 2.5 volt power supply for the CPU core
- onboard 2.5 volt power supply for the CPU I/O
- onboard 3.3 volt power supply for the chip set, memory, and PCI devices

Miscellaneous Functions

Keyboard Controller

The PC-compatible keyboard controller connection is a 6-pin mini-DIN circular connector.

Battery

A built-in socketed coin-cell battery backs up the real-time clock and CMOS-RAM.

Miscellaneous Function Connector

A 14-pin header connector allows access to several miscellaneous functions of the CPU card.

Peripheral Interfaces

Serial Ports

The COM1 serial port is in a user-definable I/O address range. The default is 3F8. The default is for COM1 serial port interrupts to be signaled using IRQ4. Connection to COM1 is by a standard male DB-9 connector mounted on the card bracket.

The COM2 serial port is in a user-definable I/O address range. The default is 2F8. The default is for COM2 serial port interrupts to be signaled using IRQ3. Connection to COM2 is through a standard header connector on the board that is shared with the parallel port.

Both COM ports are 16C550-compatible and contain FIFOs.

Parallel Port

The parallel port is in a user-definable I/O address range (278, 3BC, or 378). Parallel port interrupts are signaled using IRQ7. Connection to this port is through a header connector on the board that is shared with the COM2 serial port.

Floppy Disk Controller

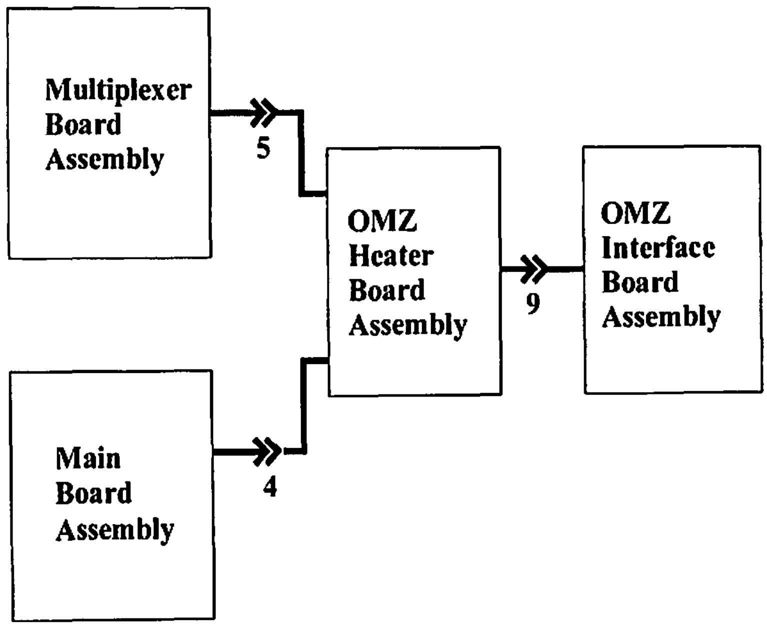
The floppy disk controller is PC compatible. It uses bus interrupt IRQ6 and the 8-bit DMA channel that corresponds to DRQ2 and ~DACK2 on the AT-bus. Connection to a floppy disk drive is through a standard 34-pin ribbon-cable header, which is mounted on the board.

Co-oximeter OMZ Heater PC Board

The OMZ (Optical Measurement Zone) Heater PC board provides two functions:

- interfaces the slide cell position detectors, located on the OMZ Interface board, in the optics head with the Main board
- amplifes and powers the Co-ox heater

OMZ Heater PC Board Block Diagram



Analog Signals

Analog and Other Input Signals

Input Signal	Description
THERMISTOR_LOW_IN	One end of the thermistor located on the OMZ interface board.
THERMISTOR_HI_IN	Other end of the thermistor located on the OMZ interface board.
SLIDE_POS1_IN	Signal from detector 1 located on the OMZ interface board.
SLIDE_POS2_IN	Signal from detector 2 located on the OMZ interface board.
SLIDE_LED	Power signal to a LED from the MUX board.
SLIDE_GND	Ground signal to a LED from the MUX board.
+5 VOLTS	Power supply input signal from the MUX board.
GROUND	Power supply return signal from the MUX board assembly.
HEATER_IN	Heater control signal from the MUX board assembly.

Analog and Other Output Signals

Output Signal	Description
HEATER_DRIVE	+5 V power supply signal to the chip heater located on the OMZ interface board.
HEATER_RETURN	Ground signal to the chip heater located on the OMZ interface board.
SLIDE_LED_OUT	Power signal to a LED located on the OMZ interface board.
SLIDE_GND_OUT	Ground signal to a LED located on the OMZ interface board.
THERMISTOR_LOW_OUT	Thermistor signal to the MUX board.
THERMISTOR_HI_OUT	Thermistor signal to the MUX board.
SLIDE_POS1_OUT	Signal from detector 1 to the MUX board.
SLIDE_POS2_OUT	Signal from detector 2 to the MUX board.

NOTE: There are no switch settings or jumpers on the OMZ Heater Board.

System Diagrams and Cable Drawings

System Diagrams

This section includes four system diagrams:

- menu map
- fluidic diagrams
- system electronic block text diagram
- cable interconnect diagram

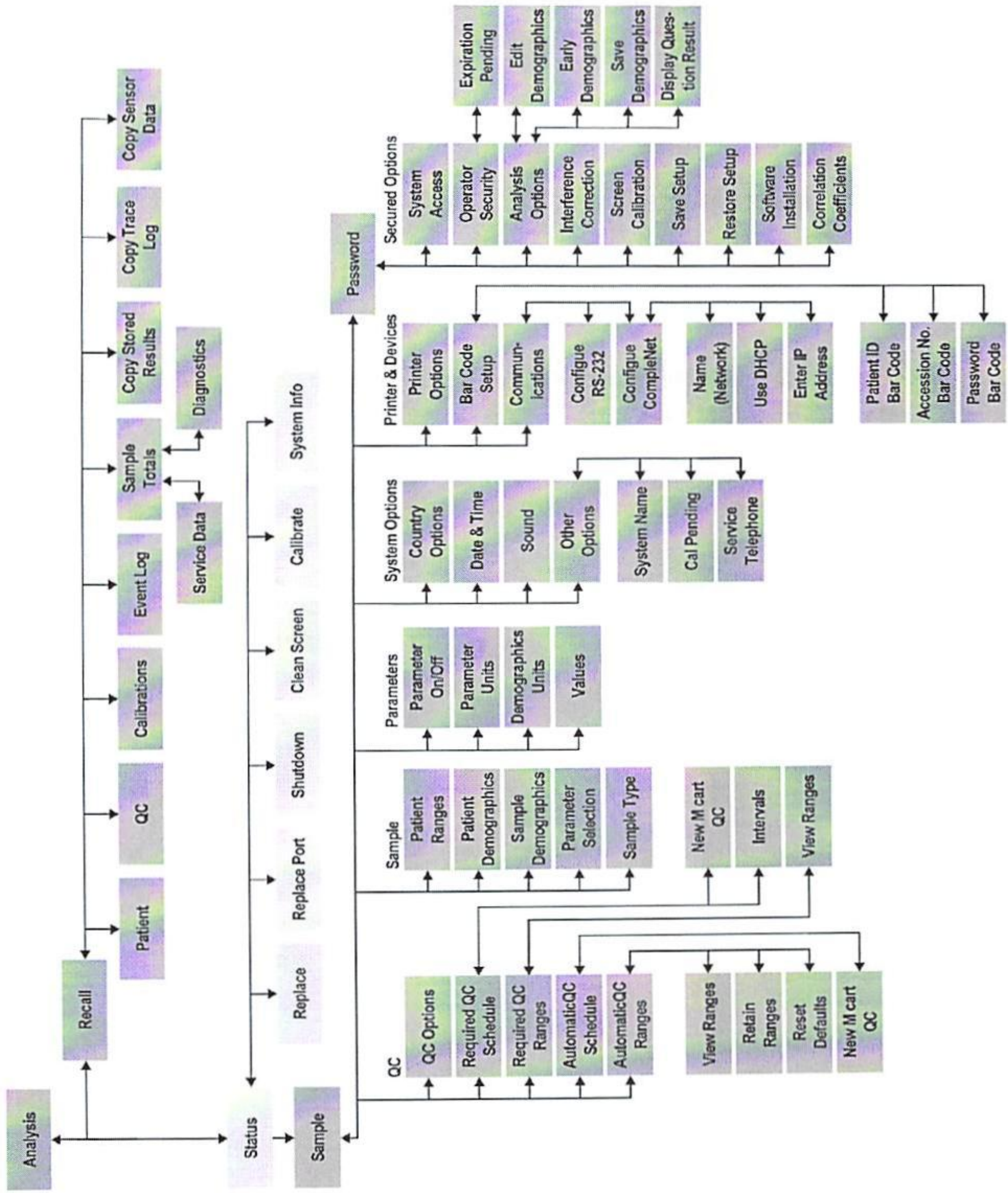
The menu map illustrates system navigation.

The fluidic diagrams illustrate the various valve positions with the associated fluid path.

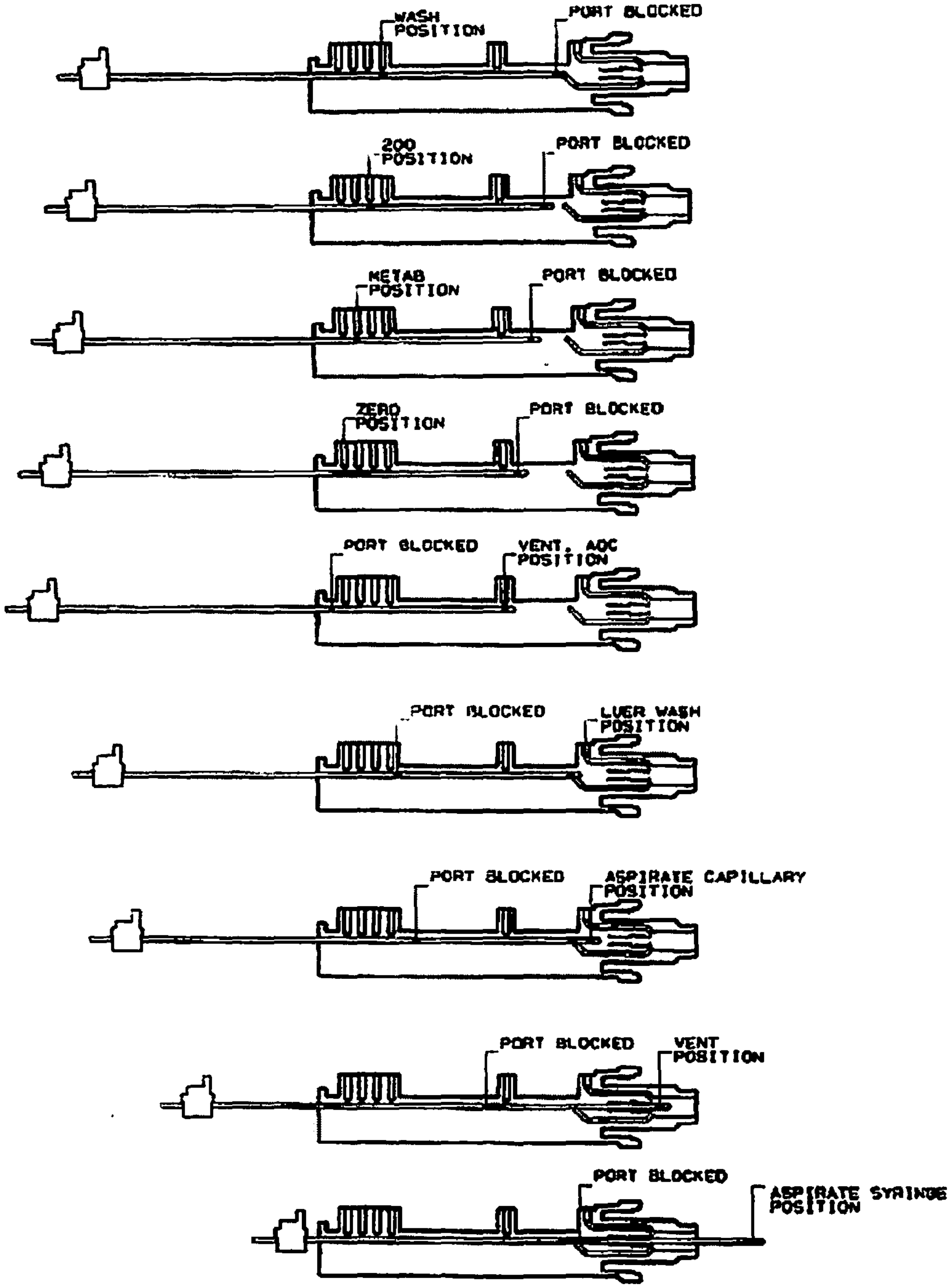
The system block text diagram illustrates the major Rapidpoint 400 series systems assemblies and the printed circuit boards that are a part of each assembly.

The cable interconnect diagram illustrates how the Rapidpoint 400 series systems cables are connected within the system.

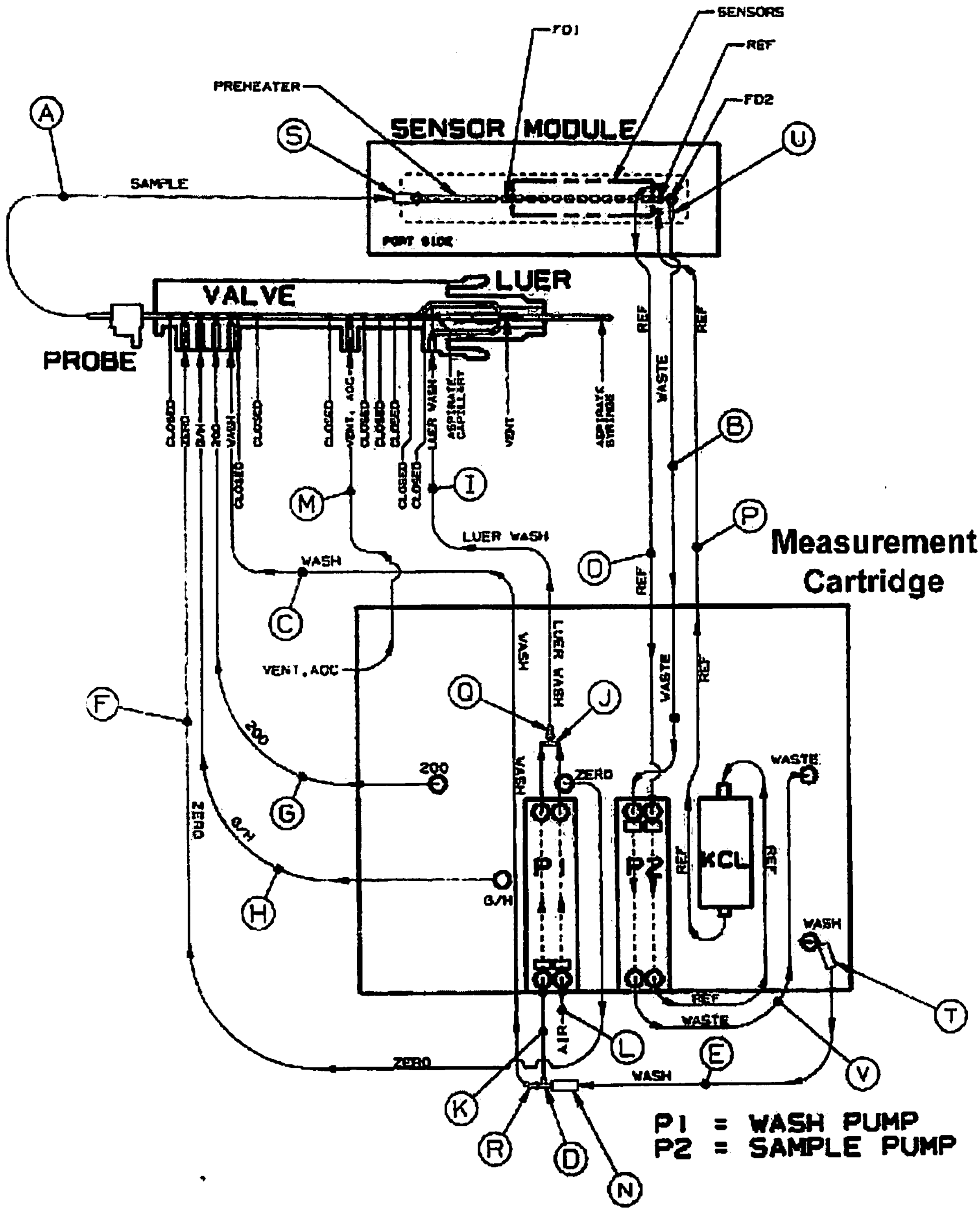
Rapidpoint 400 Series Systems Menu Map



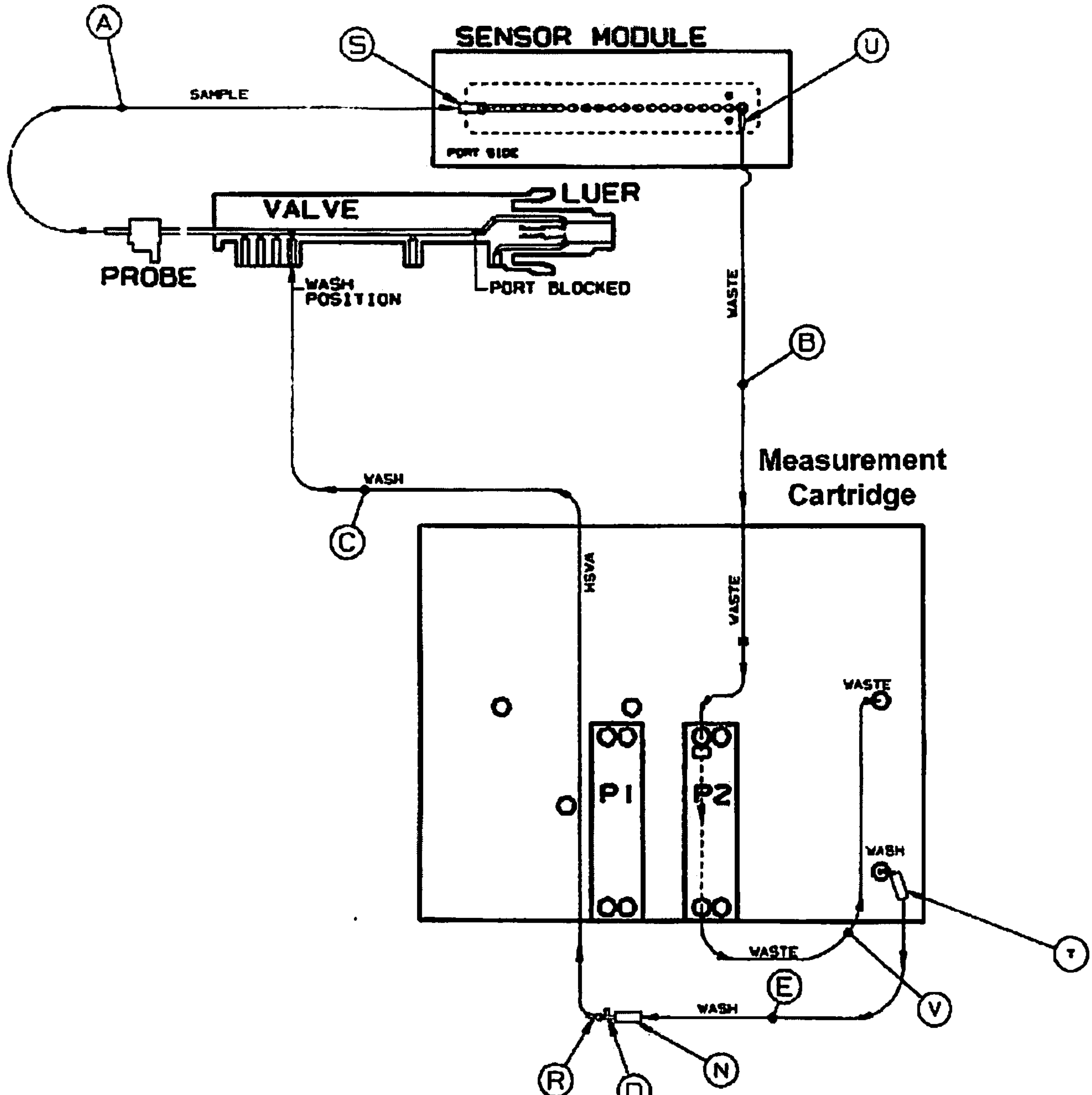
Fluidic Diagrams



VALVE POSITIONS

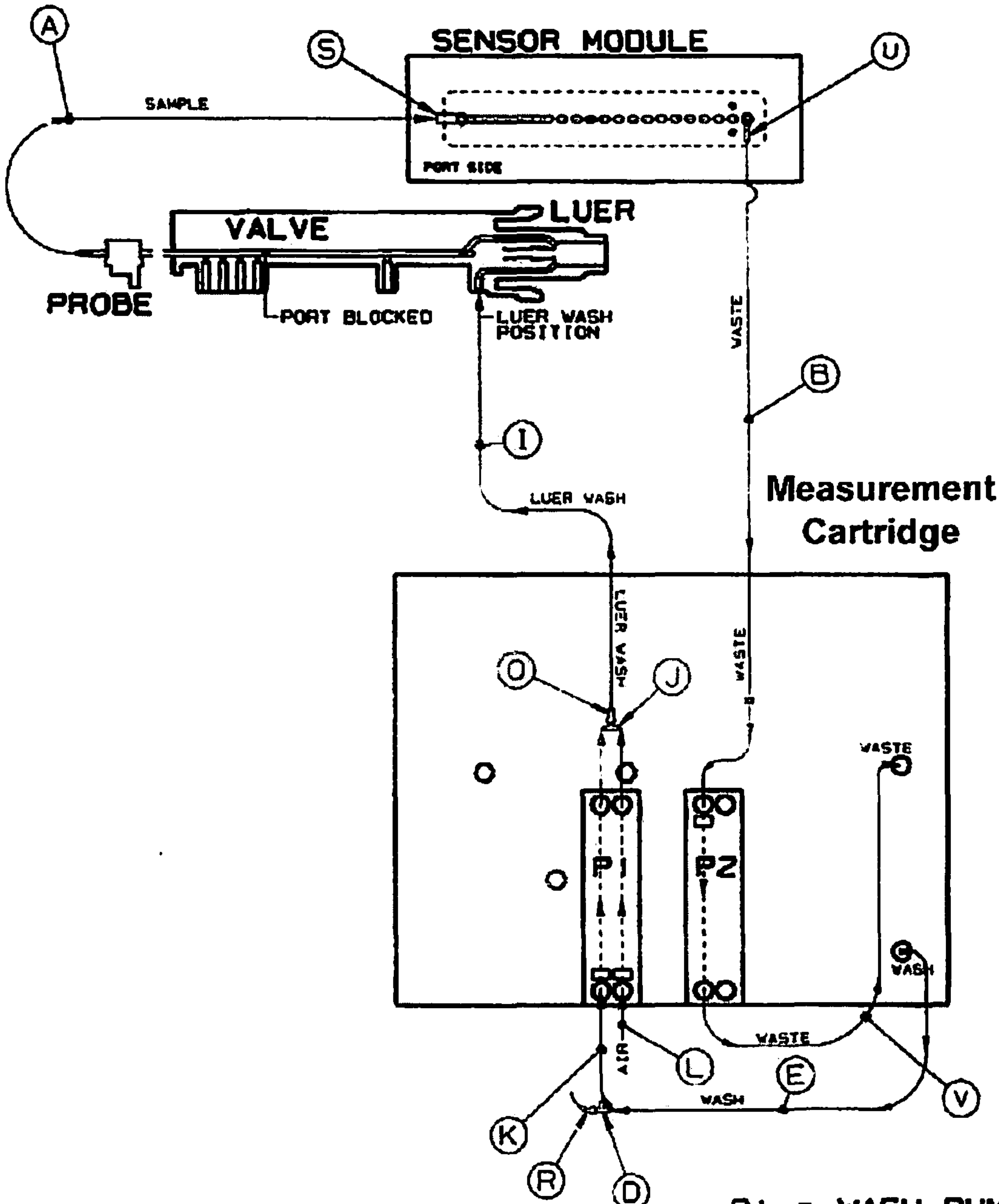


SENSOR MODULE
PREHEATER
FD1
SENSORS
REF
FD2
SAMPLE
PORT SIDE
VALVE
LUER
PROBE
CLOSED
ZERO
B/H
200
WASH
VENT, ADC
LUER WASH
ASPIRATE CAPILLARY
VENT
ASPIRATE SYRINGE
WASTE
Measurement
Cartridge
VENT, ADC
P1
P2
KCL
AIR
P1 = WASH PUMP
P2 = SAMPLE PUMP



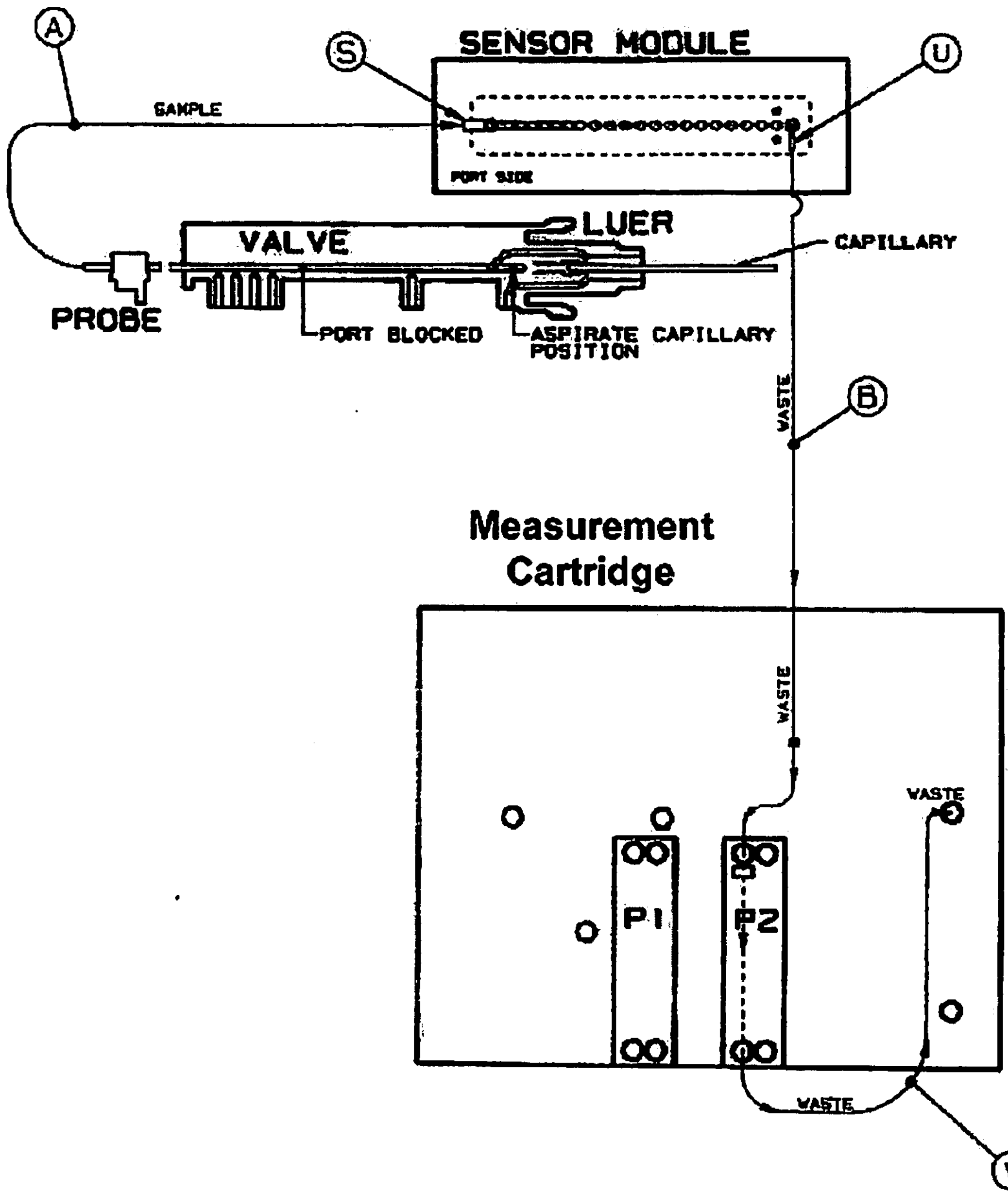
WASH POSITION

P1 = WASH PUMP
P2 = SAMPLE PUMP



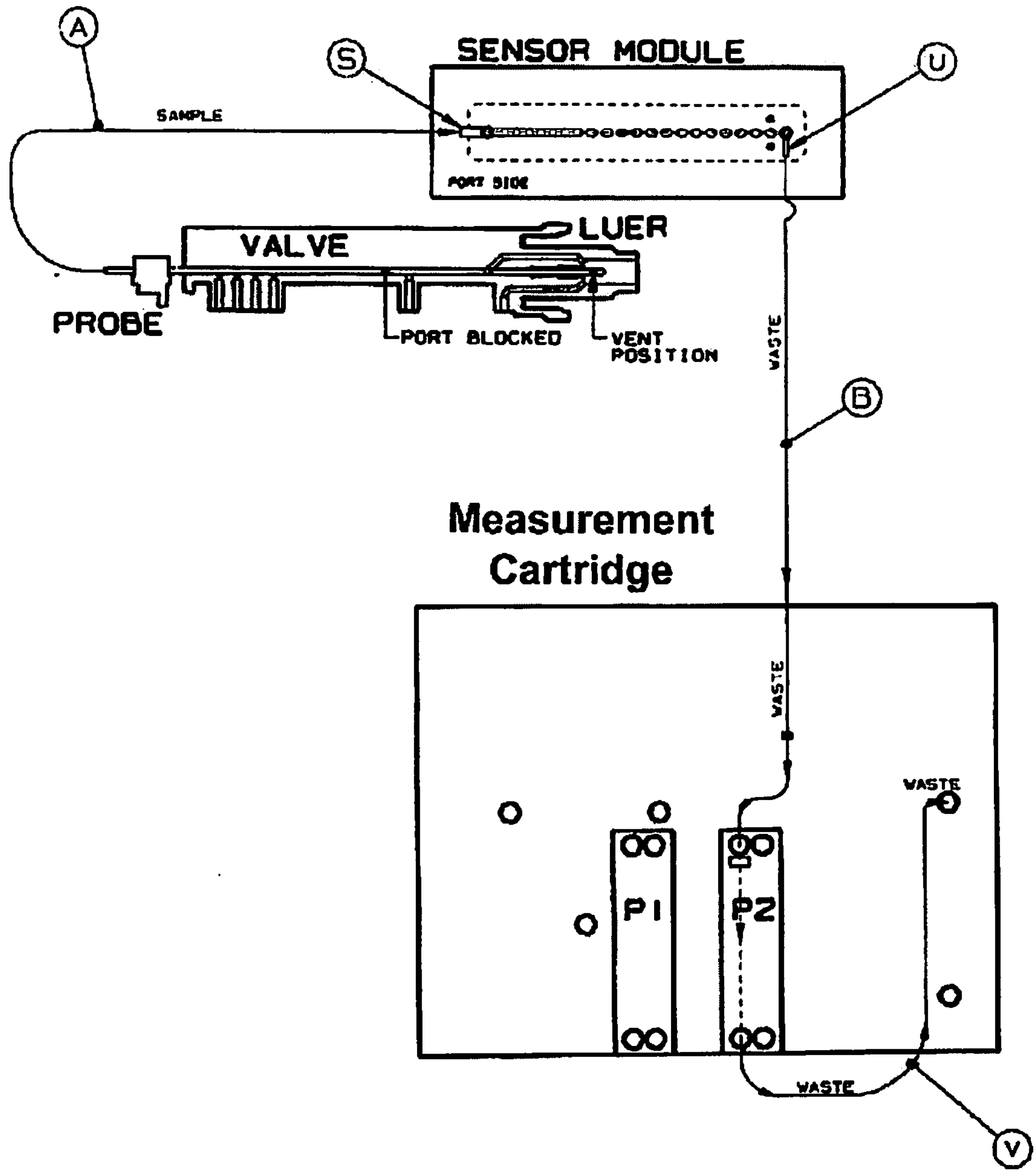
LUER WASH POSITION

P1 = WASH PUMP
P2 = SAMPLE PUMP



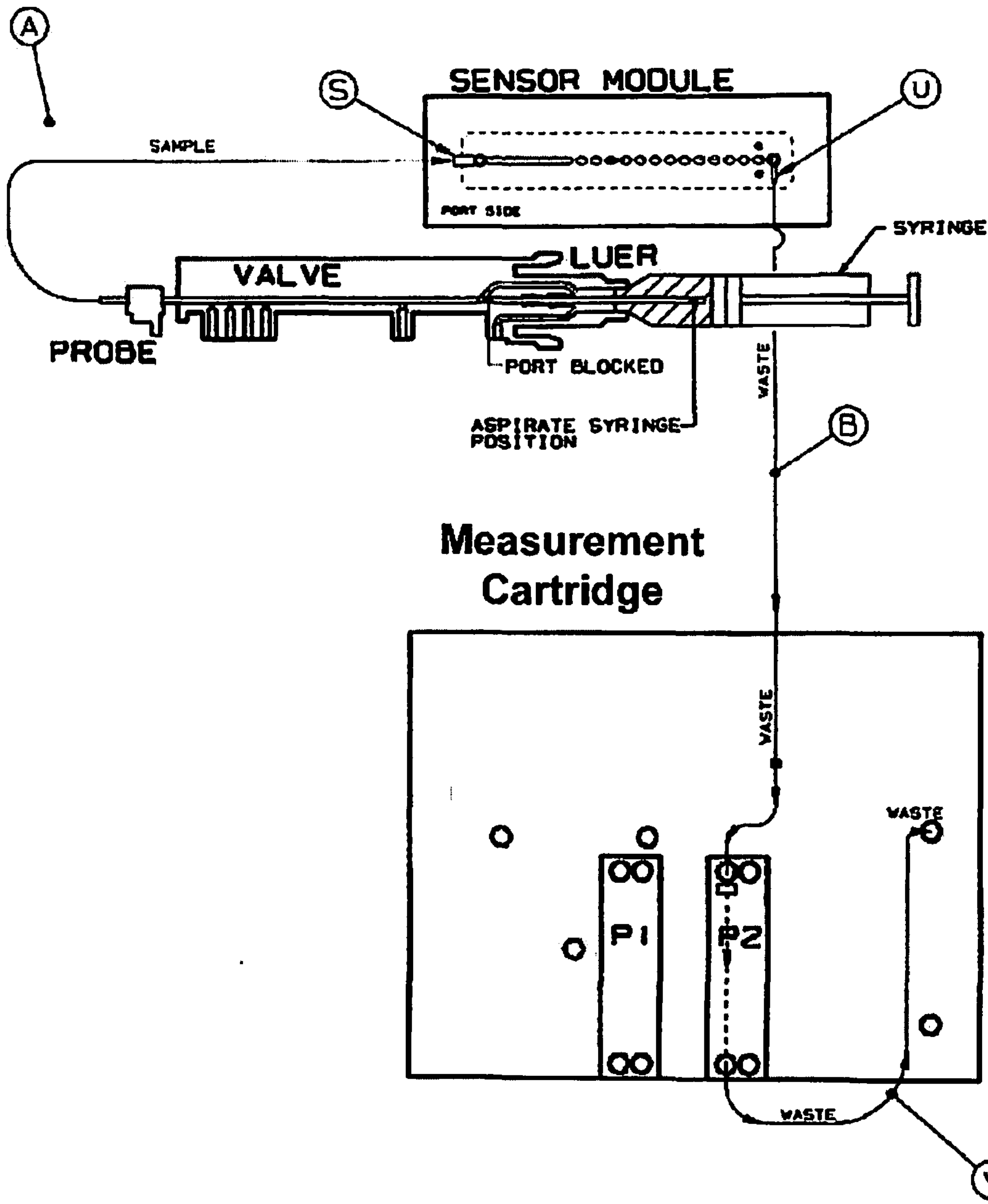
ASPIRATE CAPILLARY POSITION

P1 = WASH PUMP
P2 = SAMPLE PUMP



P1 = WASH PUMP
P2 = SAMPLE PUMP

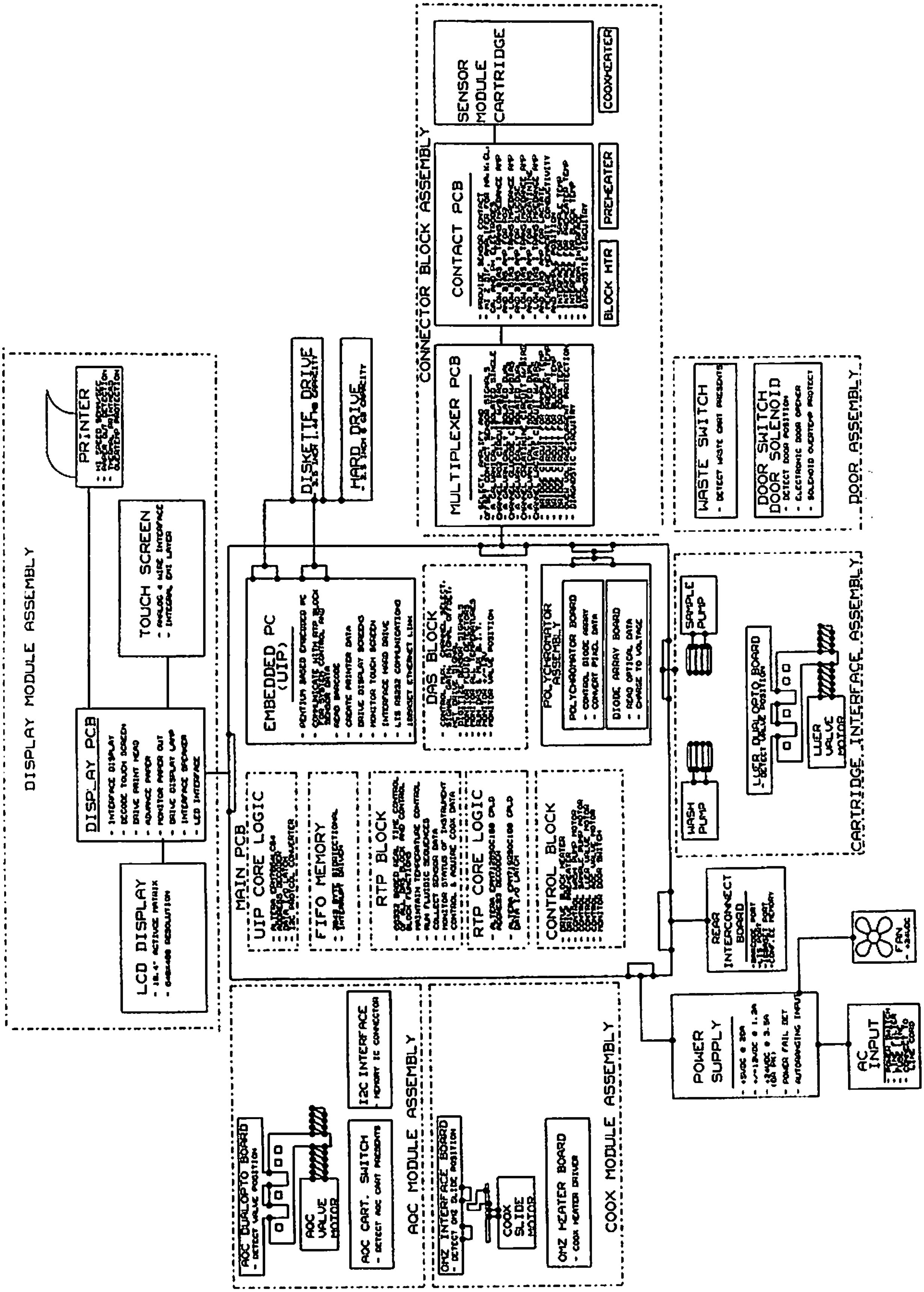
VENT POSITION



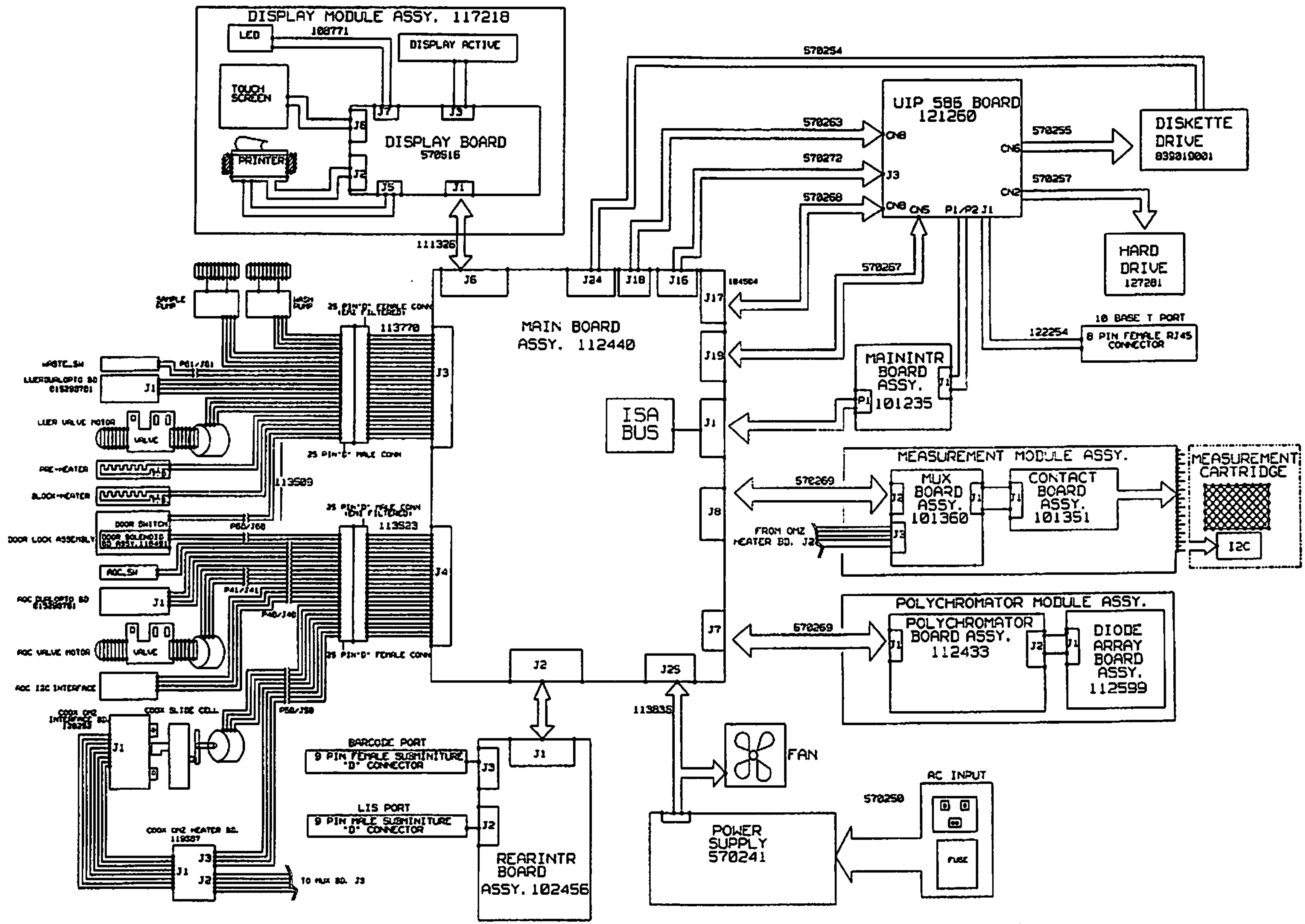
ASPIRATE SYRINGE POSITION

P1 = WASH PUMP
P2 = SAMPLE PUMP

Rapidpoint 400 Series Systems Electronic Block Text Diagram

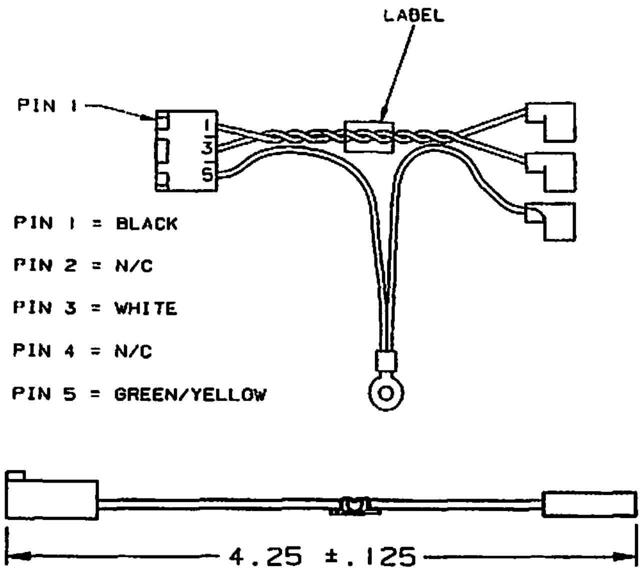


Rapidpoint 400 Series Systems Cable Interconnect Diagram

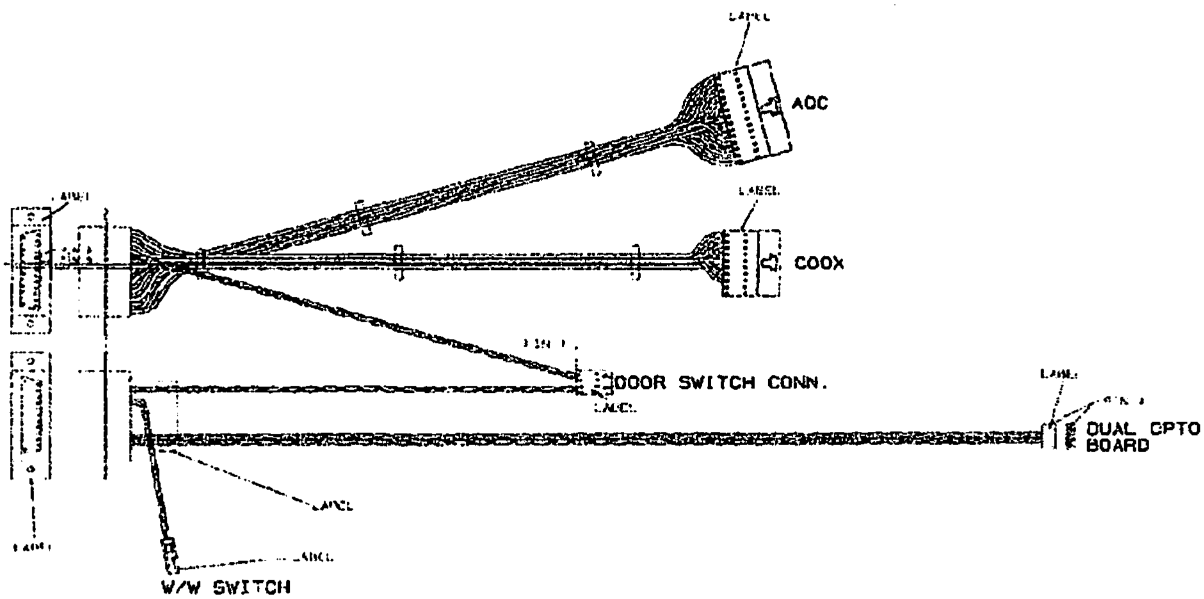


Cable Drawings

A.C. Power Harness Assembly 570250

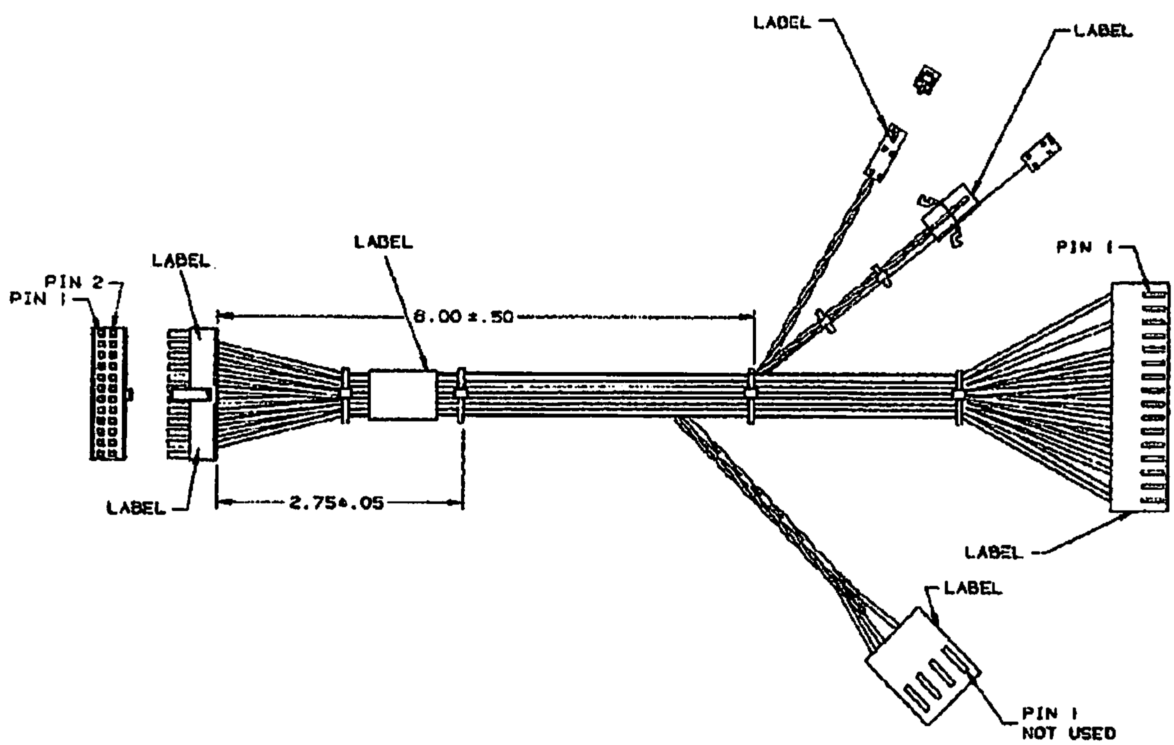


Cable Harness, Outboard Assembly 113509

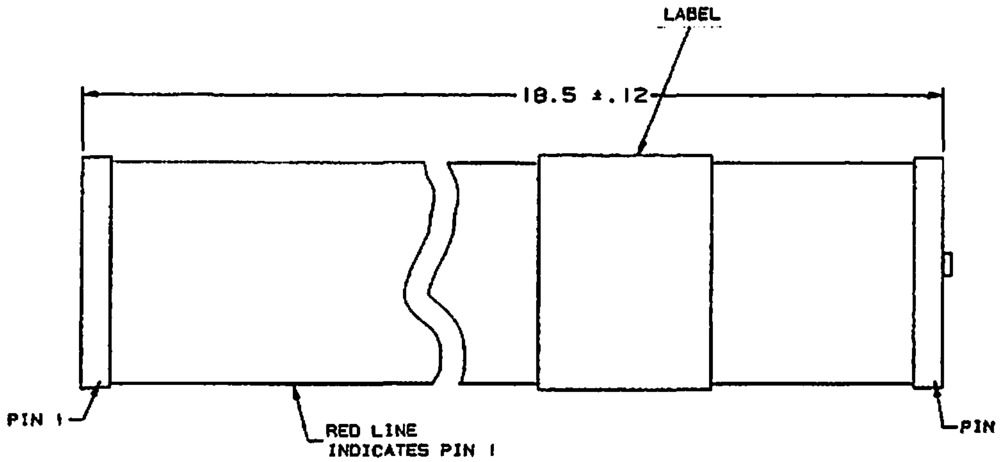


D.C. Power Harness Assembly 113836

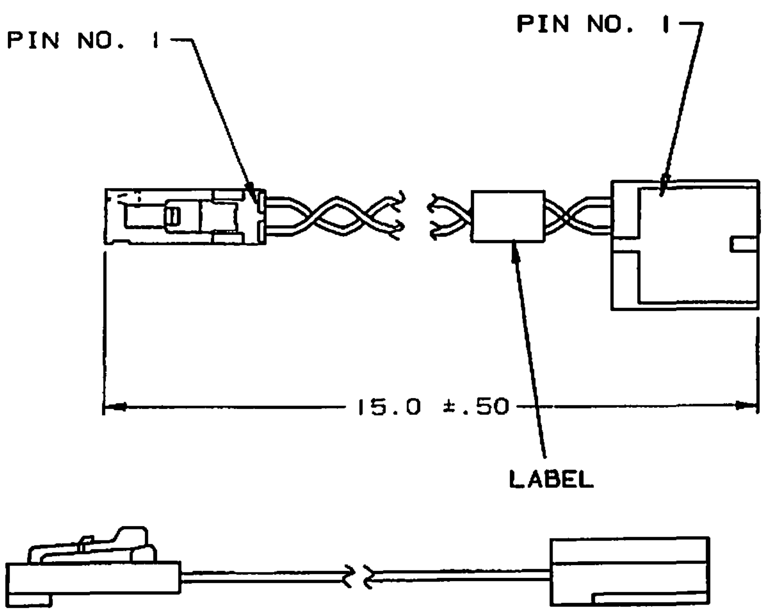
WIRE RUN	ITEM NO.	SIGNAL NAME	RUN FROM P25	RUN TO P3,P2	WIRE GAGE	WIRE COLOR	WIRE LENGTH	[illegible] PART NO.
1	11	P12V	MAIN. P25.2	POWER SUPPLY. P3.1	24	BLACK	11.0	858010151
2	11	M12V	MAIN. P25.4	POWER SUPPLY. P3.3	24	BLACK	11.0	858010151
3	12	MOTOR 24V	MAIN. P25.15	POWER SUPPLY. P3.5	20	BLACK	10.0	858010011
4	12	HEATER 24V	MAIN. P25.16	POWER SUPPLY. P3.6	20	BLACK	10.0	858010011
5	12	GROUND	MAIN. P25.3	POWER SUPPLY. P3.7	20	BLACK	10.0	858010011
6	12	GROUND	MAIN. P25.5	POWER SUPPLY. P3.8	20	BLACK	10.0	858010011
7	12	GROUND	MAIN. P25.6	POWER SUPPLY. P3.9	20	BLACK	10.0	858010011
8	12	GROUND	MAIN. P25.7	POWER SUPPLY. P3.10	20	BLACK	10.0	858010011
9	12	GROUND	MAIN. P25.8	POWER SUPPLY. P3.11	20	BLACK	10.0	858010011
10	12	GROUND	MAIN. P25.9	POWER SUPPLY. P3.12	20	BLACK	10.0	858010011
11	12	VCC	MAIN. P25.11	POWER SUPPLY. P3.13	20	BLACK	9.5	858010011
12	12	VCC	MAIN. P25.12	POWER SUPPLY. P3.14	20	BLACK	9.5	858010011
13	12	VCC	MAIN. P25.13	POWER SUPPLY. P3.15	20	BLACK	9.5	858010011
14	12	VCC	MAIN. P25.14	POWER SUPPLY. P3.16	20	BLACK	9.5	858010011
15	11	NEON-DRV	MAIN. P25.17	NEON LAMP P6.1	24	BLACK	28.0	858010151
16	11	VCC	MAIN. P25.18	POWER SUPPLY. P2.2	24	BLACK	9.5	858010151
17	11	GROUND	MAIN. P25.19	POWER SUPPLY. P2.3	24	BLACK	9.5	858010151
18	11	PWRFAILX-	MAIN. P25.20	POWER SUPPLY. P2.4	24	BLACK	9.5	858010151
19	11	FAN 24V	MAIN. P25.1	FAN P4.1	24	BLACK	9.0	858010151
20	11	GND	MAIN. P25.10	FAN P4.2	24	BLACK	9.0	858010151
21	12	LAMP+	MAIN. P25.21	LAMP CONN. P5.1	20	BLACK	22.0	858010011
22	11	LAMP-SENSE+	MAIN. P25.22	LAMP CONN. P5.1	24	BLACK	22.0	858010151
23	12	LAMP-	MAIN. P25.23	LAMP CONN. P5.2	20	BLACK	22.0	858010011
24	11	LAMP-SENSE-	MAIN. P25.24	LAMP CONN. P5.2	24	BLACK	22.0	858010151



Diskette Drive Cable Assembly 570255

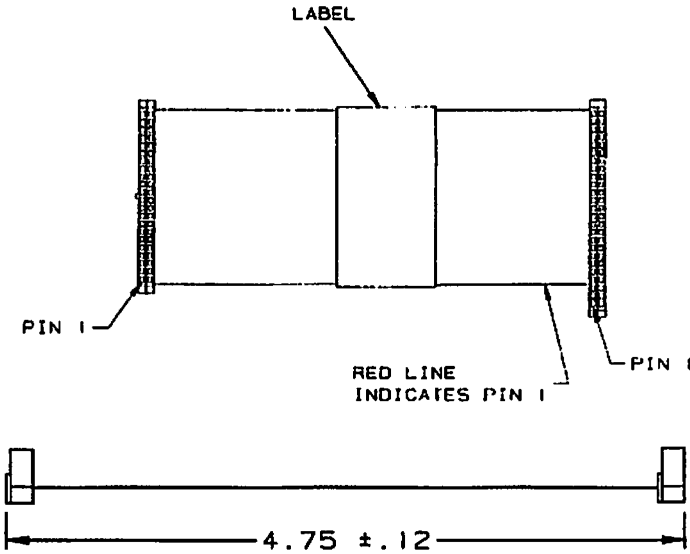


Diskette Power Harness 570254

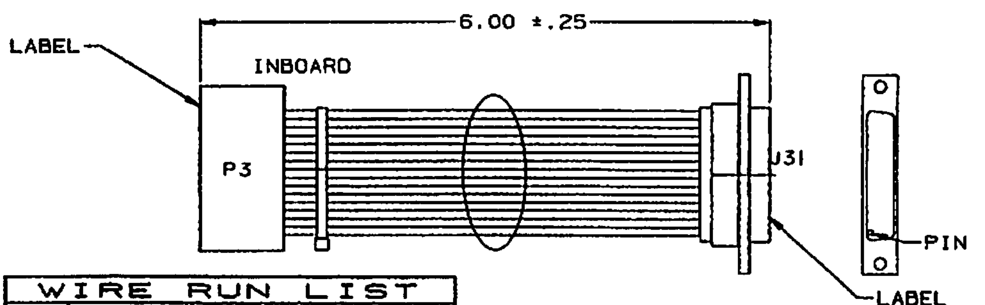


WIRE RUN LIST		
COLOR	CONN. A	CONN. B
BLACK	PIN 1	PIN 1
BLACK	PIN 2	PIN 2
	-	-
	-	-

Hard Drive Cable Assembly 570257

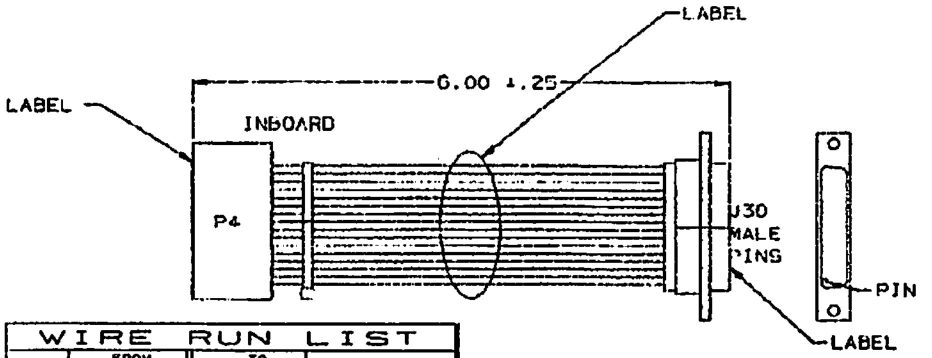


Inboard 1 Harness 113770



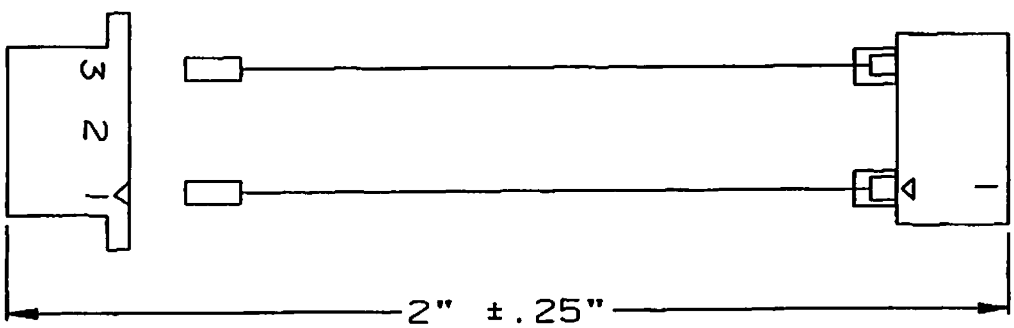
WIRE RUN LIST					
	FROM		TO		
RUN NO.	CONN. REF. DESTN	PIN NO.	CONN. REF. DESTN	PIN NO.	WIRE ITEM NO. COLOR & GAGE
1	P3	1	J31	14	5 BLK 24 AWG
2	P3	2	J31	15	
3	P3	3	J31	16	
4	P3	4	J31	17	
5	P3	5	J31	22	
6	P3	6	J31	23	
7	P3	7	J31	24	
8	P3	8	J31	25	
9	P3	9	J31	10	
10	P3	10	J31	11	
11	P3	11	J31	12	
12	P3	12	J31	13	
13	P3	13	J31	1	
14	P3	14	J31	2	
15	P3	15	J31	3	
16	P3	16	J31	4	
17	P3	17	J31	5	
18	P3	18	J31	6	
19	P3	19	J31	8	
20	P3	20	J31	9	
21	P3	21	J31	18	
22	P3	22	J31	19	
23	P3	23	J31	20	
24	P3	24	J31	21	5 BLK 24 AWG

Inboard 2 Harness 113523

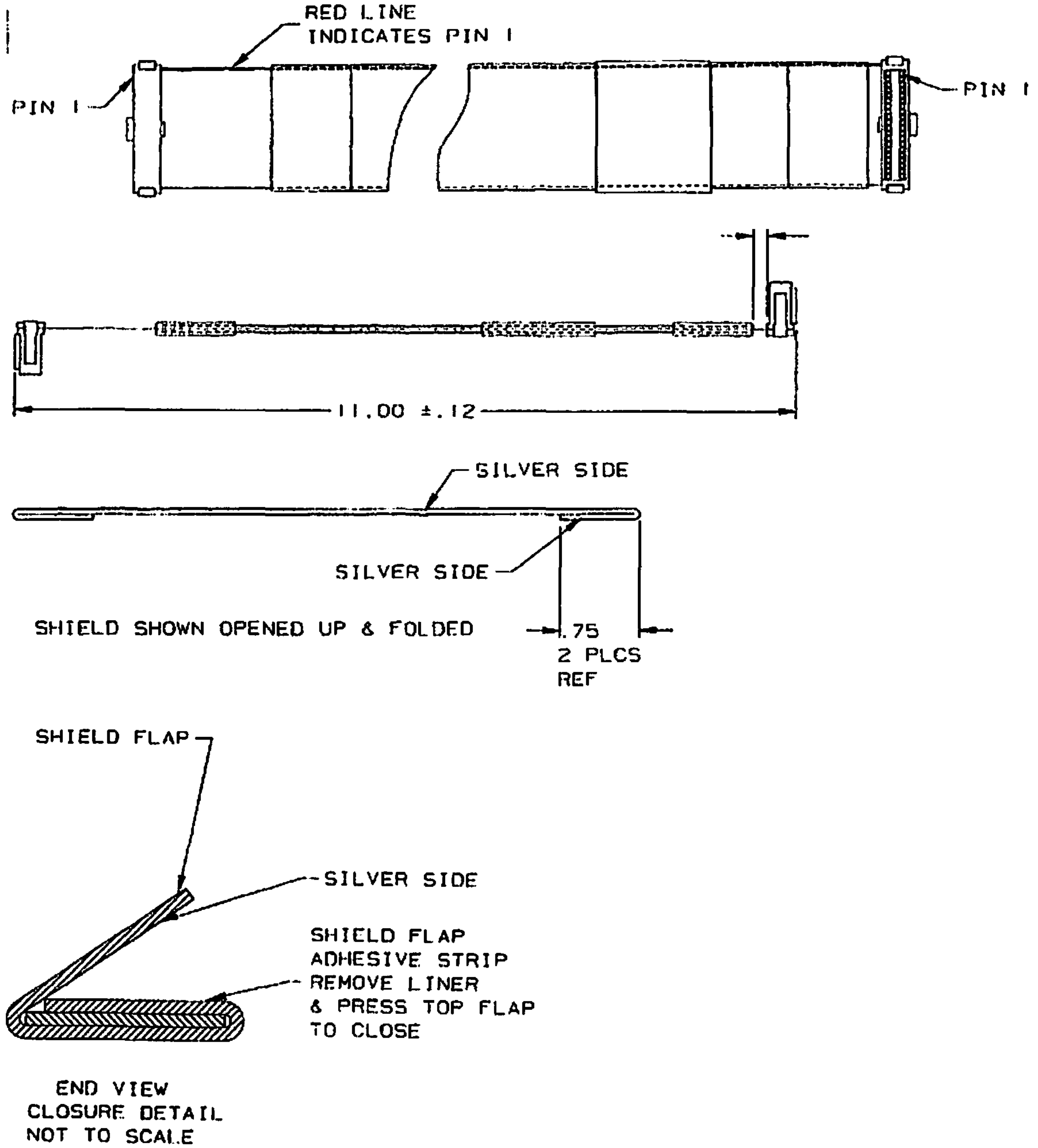


WIRE RUN LIST					
	FROM		TO		
RUN NO.	CONN. REF. DESTN	PIN NO.	CONN. REF. DESTN	PIN NO.	WIRE ITEM NO. COLOR & GAGE
1	P4	1	J30	14	5 BLK 24 AWG
2	P4	2	J30	15	
3	P4	3	J30	16	
4	P4	4	J30	17	
5	P4	5	J30	18	
6	P4	6	J30	19	
7	P4	7	J30	20	
8	P4	8	J30	21	
9	P4	9	J30	22	
10	P4	10	J30	23	
11	P4	11	J30	24	
12	P4	12	J30	5	
13	P4	13	J30	25	
14	P4	14	J30	6	
15	P4	15	J30	1	
16	P4	16	J30	2	
17	P4	17	J30	3	
18	P4	18	J30	4	
19	P4	19	J30	10	
20	P4	20	J30	11	
21	P4	21	J30	12	
22	P4	22	J30	13	
23	P4	23	J30	8	
24	P4	24	J30	9	5 BLK 24 AWG

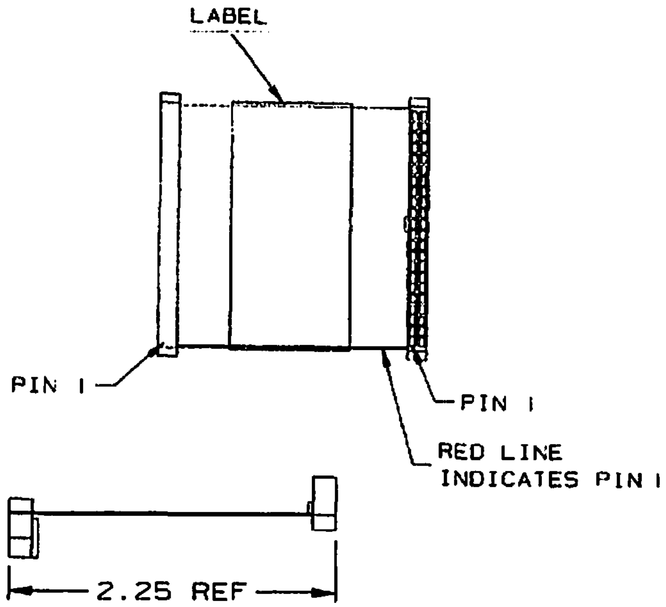
LCD Backlight Cable Assembly 108771



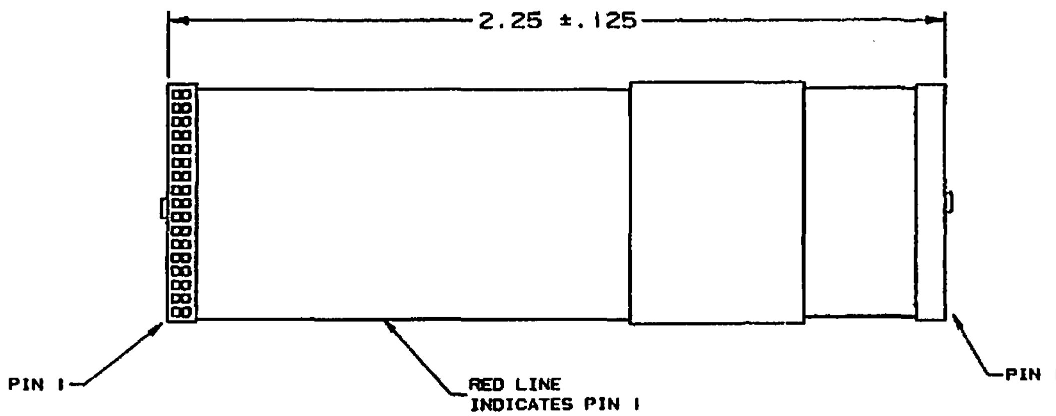
Preamp Module Cable Assembly 570269



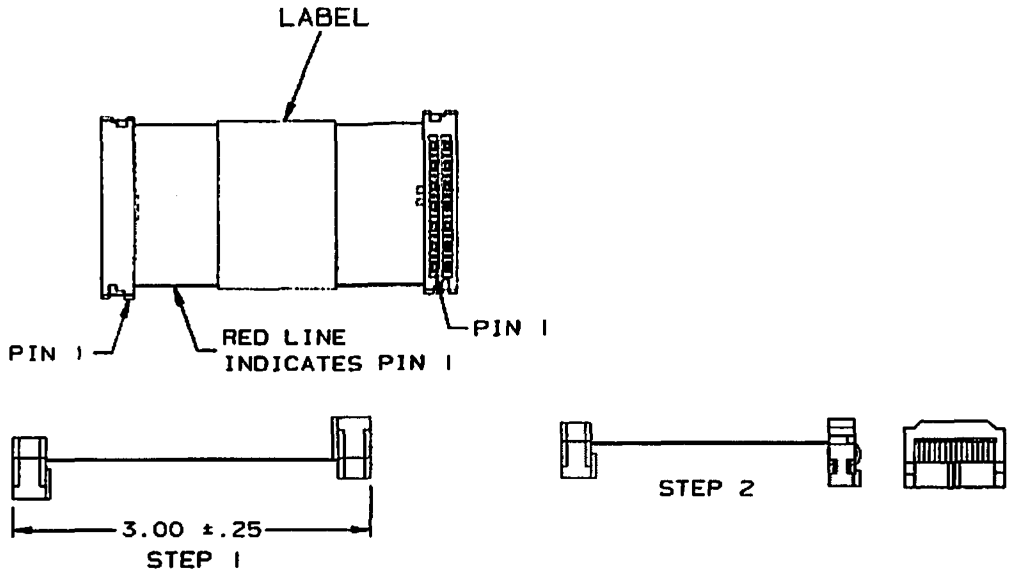
UIP Display Cable Assembly 570263



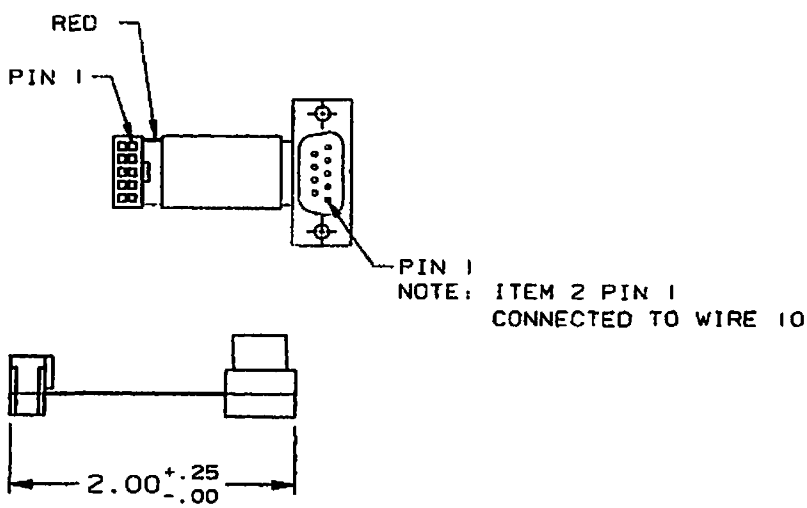
UIP LPT1/COM2 Cable Assembly 570267



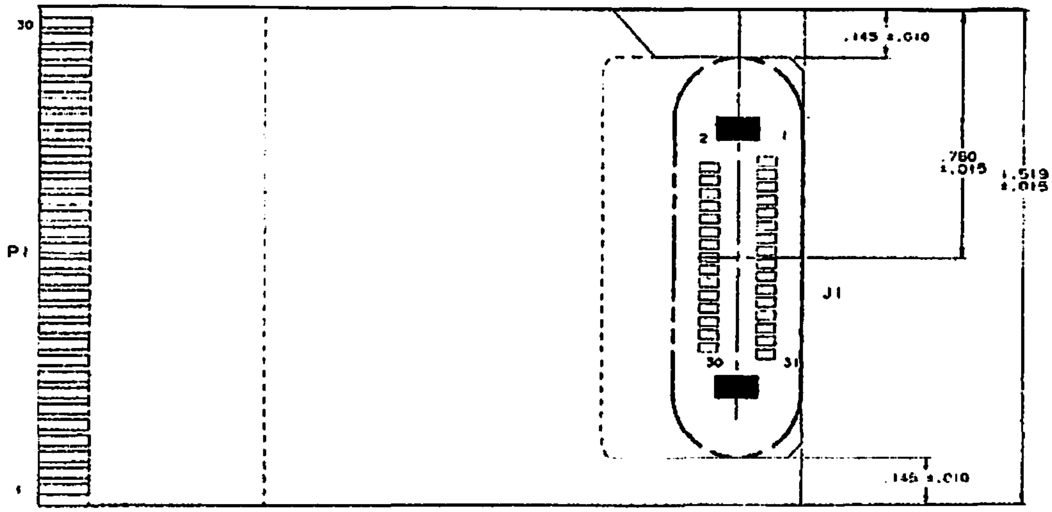
UIP Utility Cable Assembly 570268



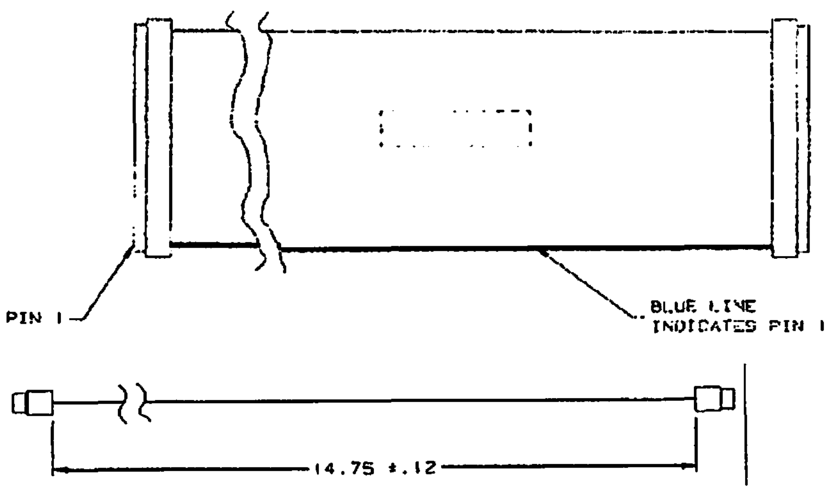
UIP COM1/Inboard Cable Assembly 570272



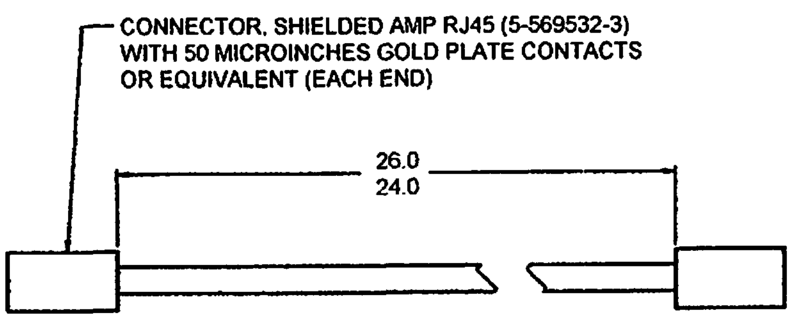
Flex Circuit Display 570516



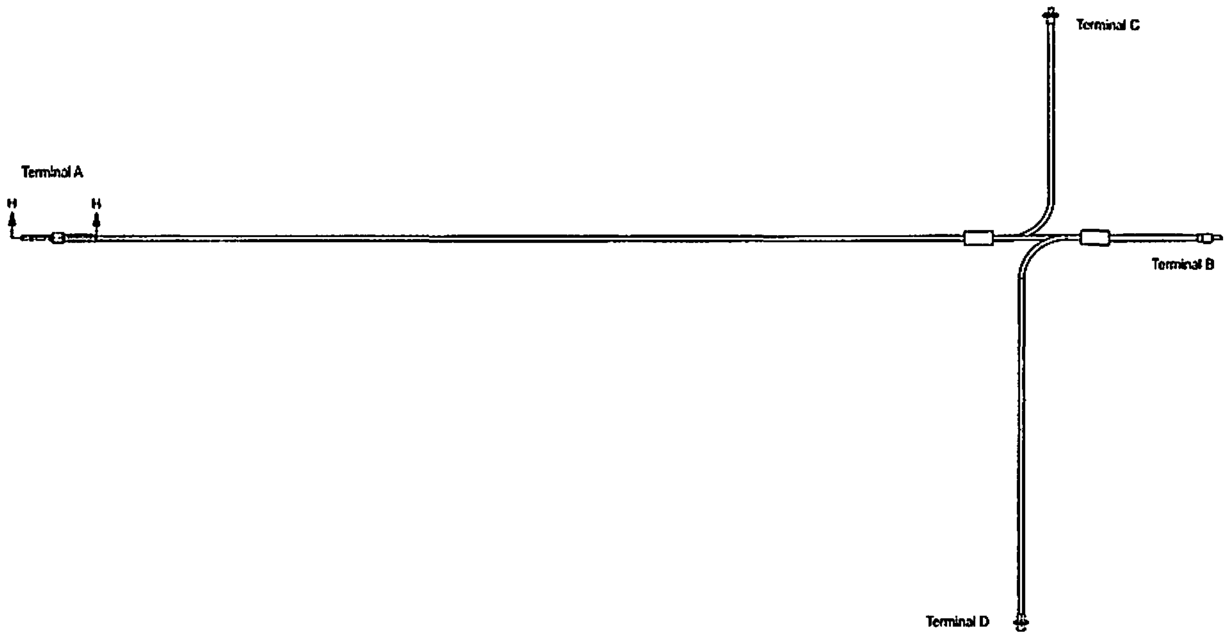
100 Pin Cable Assembly 111326



Patch Cord Cable 122254



Fiber Bundle Assembly 131527



Calibrations

Calibrating the System

Use this procedure to perform a 1-point, a 2-point, or a full calibration.

Only operators with level 1 or 2 security access can calibrate the system.

1. If prompted, enter your password, the service password, or the password of the day.
2. At the Analysis screen, touch the **Status** button.
3. Touch **Calibrate**.

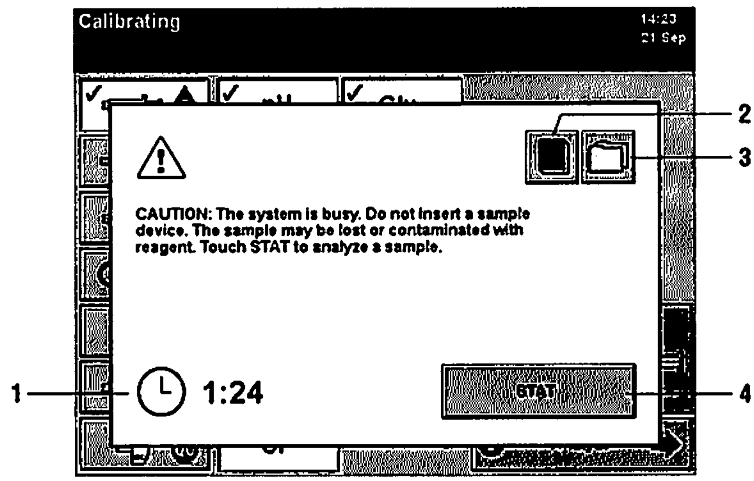
NOTE: You cannot perform calibrations for at least 3 hours after installing a new measurement cartridge. During this period, the system performs automatic calibrations.

NOTE: Some calibration types may not be available because an automatic calibration is scheduled to begin shortly. For example, a 1-point calibration is not available if a 2-point calibration is scheduled to start within 30 minutes.

4. Select the calibration type and touch **Start**.

   The calibration begins. The system displays a message indicating that the system is busy.

Figure 4-1: Calibration Message



1 Shows time remaining until the calibration finishes.

2 Touch to view the Reference Guide.

3 Touch to access the Recall options.

4 Touch **STAT** if you want to interrupt the calibration to analyze a sample.

If a parameter fails the calibration, the calibration repeats. When the calibration is finished, the Analysis screen appears.

Calibrating the Touch Screen

Use this procedure to calibrate the touch screen when the screen responds inconsistently to touches. For example, if you must touch to the left or the right of an item to select it, the touch screen needs calibration.

You can verify that the screen is out of calibration at the Diagnostics screen. When you touch the screen in Diagnostics, the cursor appears on the screen. If the cursor does not appear where you touch, the screen needs calibration.

NOTE: Only operators with level 1 security access and Bayer HealthCare service representatives can calibrate the touch screen.

1. If prompted, enter your password, the service password, or the password of the day.
2. Touch the **Status** button.
3. Touch **Setup.**
4. Touch **Secured Options.**
5. Touch **Screen Calibration.**

   The Calibration screen appears with the **Target** button in the upper left corner of the screen.

   If you do not want to calibrate the touch screen, do not touch the screen. The system automatically returns to the Setup menu after 10 seconds. The system also returns to the Setup menu after 10 seconds if you touch the screen only once.

⚠ **CAUTION:** Touch only the button that appears on the screen, and touch this button only once each time it appears. Touching any other part of the screen or touching the button more than once causes the screen to become inoperable. If the touch screen becomes inoperable, use the calibration steps detailed in Emergency Calibration of the Touch Screen.

6. Touch the button that appears in the upper left corner of the screen.

   The button disappears for 2 seconds, then reappears in the lower right of the screen.

7. Touch the button again when it appears on the screen.

   The system returns to the Setup menu when the touch screen is calibrated.

8. Touch the **Continue** button twice to return to the Analysis screen.

Emergency Calibration of the Touch Screen

An emergency calibration is required when the screen becomes inoperable because an area of the screen other than the target button is touched or the target button is touched more than once during routine calibration.

1. Restart the system.

NOTE: If the touch screen does not appear on the first attempt, restart the system again. Wait until the progress bar appears for the second time on the Bayer logo screen and then touch the screen.

2. When the screen with the Bayer logo appears, touch the screen within 4 seconds.

   Wait for the system to complete startup and the Calibration screen appears.

CAUTION: Touch only the button that appears on the screen, and touch this button only once each time it appears. Touching any other part of the screen or touching the button more than once causes the screen to become inoperable. If the touch screen becomes inoperable, repeat steps 1 through 3.

3. Touch the button that appears on the screen.

   The button disappears for 2 seconds, then reappears in the lower right of the screen.

4. Touch the button that appears on the screen.

   The Wait screen appears followed by the Cartridge Initialization screen, and initialization begins.

Troubleshooting

Troubleshooting Problems

Button and Parameter Status

Refer to this section when buttons and parameters at the Analysis screen are not available.


The buttons that you touch to select the patient sample are not available.

The QC syringe button is also unavailable.

Probable Cause	Corrective Action
You replaced the measurement cartridge but have not yet analyzed the controls that are scheduled for the newly installed cartridge.	Analyze the Required QC samples as described in *Analyzing Required QC Samples* in Section 2 in the *Rapidpoint 400 Series Operator's Manual.*

The **QC!** button on the Analysis screen is not available.

Probable Cause	Corrective Action
The lot is expired for the control that is currently scheduled, or no lot is entered for the control.	1. Define a new lot of the control as described in *Defining New Lots of Controls for Required QC* in Section 6 in the *Rapidpoint 400 Series Operator's Manual.* 2. Analyze the scheduled controls as described in *Analyzing Required QC Samples* in Section 2 in the *Rapidpoint 400 Series Operator's Manual.*

The parameter is yellow with a line through it, and QC appears in the lower left corner.

Probable Cause	Corrective Action
The sensor has drifted since the last automatic calibration.	For pH, pO_2, pCO_2, Na^+, K^+, Ca^{++}, Cl^-, and Glu, perform a 2-point calibration. For Hct or tHb, perform a full calibration.

(Continued)

Probable Cause	Corrective Action
The parameter failed Required QC analysis because errors occurred during storage or handling of the control.	1. Follow the storage and handling requirements provided in the product insert for the control. 2. Analyze the QC samples as described in *Analyzing Unscheduled QC Samples* in Section 2 in the *Rapidpoint 400 Series Operator's Manual.* If the results are within range, turn the parameter on as described in *Restoring Parameters* in Section 2 in the *Rapidpoint 400 Series Operator's Manual.*
Parameter(s) failed AutomaticQC because the measurement or AutomaticQC cartridge is not working correctly	Perform the following steps until the system is ready for use. 1. Perform up to two 2-point calibrations. If a 2-point calibration is not available, wait for the system to perform an automatic calibration. 2. If the parameter fails the 2-point calibrations, the problem is with the measurement cartridge. Replace the measurement cartridge. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.* 3. If the parameter passes the 2-point calibrations, perform another AutomaticQC analysis for the failed level of control. Refer to *Analyzing AutomaticQC Samples* in Section 2 in the *Rapidpoint 400 Series Operator's Manual.* A successful AutomaticQC means the system is ready for use. 4. If the parameter fails AutomaticQC analysis in step 3, analyze a QC sample for the failed level using QC material from an ampule. Refer to *Analyzing Unscheduled QC Samples* in Section 2 in the *Rapidpoint 400 Series Operator's Manual.* 5. If the system fails the ampule QC analysis in step 4, the problem is with the measurement cartridge. Replace the measurement cartridge. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3.

(Continued)

Probable Cause	Corrective Action
	6. If the system passes the ampule QC analysis in step 4, the problem is with the AutomaticQC cartridge. a. Replace the AutomaticQC cartridge. Refer to *Replacing the AutomaticQC Cartridge* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.* b. Perform another AutomaticQC analysis for the failed level of control. 7. If the system continues to fail AutomaticQC analysis, call for technical assistance
The parameter failed Required QC or AutomaticQC analysis because the target ranges for one or more parameters are too narrow.	1. Verify the target ranges entered for the control. If you specify target ranges that are narrower than those provided with the control, parameters may fail Required QC or AutomaticQC analysis more frequently. Refer to *Viewing and Editing Target Ranges for Quality Control* in Section 6 in the *Rapidpoint 400 Series Operator's Manual* if you need to adjust the target ranges. 2. For Required QC samples, analyze samples as described in *Analyzing Unscheduled QC Samples* in Section 2 in the *Rapidpoint 400 Series Operator's Manual.* If the results are within range, turn the parameter on as described in *Restoring Parameters* in Section 2 in the *Rapidpoint 400 Series Operator's Manual.* For AutomaticQC samples, analyze samples as described in *Analyzing AutomaticQC Samples* in Section 2 in the *Rapidpoint 400 Series Operator's Manual.* If the results are within range, the system turns the parameter on. 3. If the parameter continues to fail QC analysis, replace the cartridges as described in *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.*


The parameter is purple with a line through it, and QC! appears in the lower left corner.

Probable Cause	Corrective Action
Required QC analysis was not performed when scheduled.	1. Analyze all the currently scheduled controls as described in *Analyzing Required QC Samples* in Section 2 in the *Rapidpoint 400 Series Operator's Manual.* 2. If the scheduled controls do not contain the necessary parameters, analyze QC for the parameters as described in *Analyzing Unscheduled QC Samples* in Section 2 in the *Rapidpoint 400 Series Operator's Manual.* If the results are within range, turn the parameter on as described in *Restoring Parameters* in Section 2 in the *Rapidpoint 400 Series Operator's Manual.*

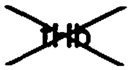

The parameter has a single line through it.

Probable Cause	Corrective Action
The parameter failed calibration.	1. View the Events Log to determine the event causing the parameter to fail, and follow the appropriate solutions for that event. 2. Subsequent calibrations may make the parameter available again. If the parameter remains out of calibration, replace the cartridges as described in *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.*
The parameter was turned off in Setup and then turned on again.	Perform a 2-point calibration to make the parameter available again.


Parameter has two crossed lines through it.

Probable Cause	Corrective Action
The parameter failed calibration and is unlikely to become available with further calibrations.	If the failed parameter is required for sample analysis, replace the cartridges as described in *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.*

(Continued)



For Rapidpoint 405 systems an error has occurred that may be caused by failing calibrations, and tHb is unlikely to become available with further calibrations. However, the problem may have a different cause which may be corrected with further intervention.	View the Events Log to determine the event causing the parameter to fail, and follow the appropriate solutions for that event.

Analyze has a line through it.*

Probable Cause	Corrective Action
If all parameters are available, the Rapidlink data management system or the LIS connected to the Rapidpoint 400 series system has turned analysis functions off for the Rapidpoint 400 series system.	Perform other tasks, such as recalling results and accessing the Setup options, if necessary. Contact your system supervisor for assistance if you need to analyze samples.
All parameters are not available because they have failed scheduled QC analysis or scheduled QC analysis was not performed.	The system is still capable of analyzing QC samples. Perform the troubleshooting procedures described in this section for failed QC analysis and for QC analysis not performed when scheduled.

* This condition appears for a few seconds when returning to the analysis screen.

The **Continue** button has a line through it.

Probable Cause	Corrective Action
If this button appears on the Status screen, the system has an error that must be corrected before you can continue.	Identify and correct the error condition displayed on the Status screen.

= 00:34

The **Replace Cartridges** symbol appears in the banner.

Probable Cause	Corrective Action
The measurement and wash/waste cartridges will soon be depleted or expired. The banner shows the number of samples or amount of time (00:34 minutes in this example) remaining until the cartridges are depleted or expired.	No action is necessary at this time. You can monitor the number of samples and amount of time remaining to determine when you want to replace the cartridges. The system prompts you to replace the cartridges when they are depleted or expired.

= 00:34

The **Wash/Waste Cartridge** symbol appears in the banner.

Probable Cause	Corrective Action
The wash/waste cartridge will soon be depleted or expired. The banner shows the number of samples or amount of time (00:34 minutes in this example) remaining until the wash/waste cartridge is depleted or expired.	No action is necessary at this time. You can monitor the number of samples and amount of time remaining to determine when you want to replace the wash/waste cartridge. The system prompts you to replace the cartridge when it is depleted or expired.

= 00:34

The **AutomaticQC Cartridge** symbol appears in the banner.

Probable Cause	Corrective Action
The AutomaticQC cartridge will soon be depleted or expired. The banner shows the number of samples or amount of time (00:34 minutes in this example) remaining until the Automatic QC cartridge is depleted or expired.	No action is necessary at this time. You can monitor the number of samples and amount of time remaining to determine when you want to replace the Automatic QC cartridge. The system prompts you to replace the cartridge when it is depleted or expired.

The CO-ox halogen lamp has failed.

Probable Cause	Corrective Action
The lamp has burned out.	1. Shut down the system as described in *Shutting Down the System*, page 256, wait 10 seconds, and then turn the system on. If the lamp still does not work, the D75 Lamp Failure message appears in the event log. 2. Replace the lamp as described in *Replacing the CO-ox Lamp* in *Replacing Components*.

Symbols on Screens and Reports

Refer to this section to identify the symbols that can appear with results on screens and printed reports.

- - - - - ↑ or - - - - - ↓ These symbols appear instead of a result on the Results screen and the report.

Probable Cause	Corrective Action
The result for the parameter is above (- - - - -↑) or below (- - - - -↓) the reporting range for the parameter.	1. Use the correct sample collection techniques and anticoagulant as described in *Collecting Patient Samples* in Section 1 in the *Rapidpoint 400 Series Operator's Manual.* 2. Use the recommended storage, handling, and mixing techniques as described in *Collecting Patient Samples* in Section 1 in the *Rapidpoint 400 Series Operator's Manual.* 3. Analyze the sample again ensuring that the sample has no bubbles. Checking for bubbles is especially important for samples introduced from capillary tubes. 4. Analyze QC samples and verify that the QC results are within the target ranges.

- - - - -? This symbol appears instead of a result on the Results screen and the report..

Probable Cause	Corrective Action
The system detected an atypical response when measuring the parameter.	Analyze the sample again to verify the result.
When this symbol appears for the hematocrit (Hct) result, it may indicate that the Hct result was not reported because sodium (Na^+) failed Required QC or AutomaticQC analysis, or Required QC was not performed.	If Required QC analysis was not performed for sodium, perform the scheduled QC and then analyze the sample again.

u The letter u appears next to the hematocrit (Hct) result on the Results screen and the report

Probable Cause	Corrective Action
The system did not correct the hematocrit result for sodium (Na^+) or potassium (K^+) because the sodium or potassium measurement is beyond the reporting range. The system used a default value of 140 mmol/L for sodium or a value of 4 mmol/L for potassium to determine the Hct result.	Analyze the sample again or analyze a QC sample to verify the result.
The system did not correct the hematocrit result for sodium (Na^+) or potassium (K^+) because the sodium or potassium sensor is out of calibration or is turned off in Setup. The system used a default value of 140 mmol/L for sodium or a value of 4 mmol/L for potassium to determine the Hct result.	Subsequent calibrations may make sodium or potassium available again. If sodium or potassium remains out of calibration, replace the cartridges as described in *Replacing the Measurement and Wash/ Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.*

No Results on Screens and Reports

If individual results do not appear on screens and reports, ensure that parameters are not turned off because they failed Required QC or AutomaticQC or missed Required QC analysis or because they are out of calibration as described in *Button and Parameter Status* on page 155. Refer to this Section to identify other causes of missing results on screens and reports.

Probable Cause	Corrective Action
The parameter was turned off at the Analysis screen.	Analyze the sample again, ensuring that the parameter is turned on at the Analysis screen, as described in *Analyzing Patient Samples* in Section 1 in the *Rapidpoint 400 Series Operator's Manual.*
The parameter was turned off in Setup.	Ensure that the parameter is turned on in Setup as described in *Selecting Parameters and Units of Measure* in Section 6 in the *Rapidpoint 400 Series Operator's Manual.*
The Rapidlink data management system or the LIS connected to the Rapidpoint 400 series system turned the parameter off.	Contact your system supervisor for assistance if you need to analyze samples and obtain results for this parameter.

(Continued)

Probable Cause	Corrective Action
The system could not report a result because a parameter used to determine the result was not reported, not available, or sample demographics were not entered.	1. Verify that the system reported valid results for all necessary parameters. Refer to *Selecting Parameters and Units of Measure* in Section 6 in the *Rapidpoint 400 Series Operator's Manual* to identify parameters that depend on other parameters for results. 2. If demographics editing is turned on in Setup, recall the sample results and enter the values for the sample demographics as described in *Editing Demographics* in Section 1 in the *Rapidpoint 400 Series Operator's Manual.* Refer to *Selecting Demographics Editing* in Section 6 in the *Rapidpoint 400 Series Operator's Manual* if you need to turn this option on. 3. Ensure that the parameters and sample demographics are turned on in Setup as described in *Selecting Parameters and Units of Measure* and *Selecting Patient and Sample Demographics* in Section 6 in the *Rapidpoint 400 Series Operator's Manual.*
You selected the mixed venous sample button and only pO_2 or pO_2 and tHb can be measured.	The system reports only pO_2 results (pO_2 and tHb results for Rapidpoint 405 systems) due to interfering substances from certain catheters. The other parameters are not available. If you know that none of your mixed venous samples are collected from a catheter that contains the benzalkonium ion, you can report all results by turning the interference correction for mixed venous samples off in Setup. Refer to *Selecting Interference Correction* in Section 6 in the *Rapidpoint 400 Series Operator's Manual.*
For QC samples on a Rapidpoint 400 system, the result for hematocrit (Hct) was not reported because the control does not contain hematocrit. Levels 1, 2, and 3 do not contain hematocrit.	Analyze level A or B to obtain QC results for hematocrit.

(Continued)

Probable Cause	Corrective Action
For QC samples on a Rapidpoint 405 system, results for blood gas, electrolytes, glucose and hemoglobin were not reported because the control does not contain these parameters. Levels A and B are the hematocrit control, which does not contain other analytes.	Analyze level 1, 2, or 3 to obtain QC results for blood gas and electrolyte parameters and glucose and hemoglobin.

Unexpected Sodium and Potassium Results

Sodium and potassium results, are higher than expected (sodium is higher than 160 mmol/L or is beyond the measurement range.)

Probable Cause	Corrective Action
If the problem is with a mixed venous sample, the sample was analyzed using a different sample type button than the mixed venous button, or the sample was analyzed without the interference correction, which caused results to be unreliable because of the benzalkonium ion in the sample.	Analyze another sample that is not mixed venous to verify results. If parameters are out of calibration, wait until the system calibrates the sensors successfully. You can continue to analyze samples but the system will not report some parameters until the sensors are in calibration.
A sample that contains an interfering substance such as the benzalkonium ion was analyzed.	Use the correct sample collection techniques and anticoagulant as described in *Collecting Patient Samples* in Section 1 in the *Rapidpoint 400 Series Operator's Manual*.

Replacing the Measurement Cartridge

Use the following table to identify the cause of problems that occur when replacing the measurement cartridge.

Problem	Probable Cause and Corrective Action
The measurement cartridge does not eject from the system when you lift up the latch to release the cartridge.	You did not lift up the latch far enough to eject the cartridge from the system. Lift up the latch as far as possible until the cartridge is ejected from the system. You did not remove the wash/waste cartridge before lifting up the latch to eject the measurement cartridge. Remove the wash/waste cartridge and then lift up the latch.
After installing a new measurement cartridge and closing the door, a message appears indicating that the measurement cartridge needs replacing. If the message appears again, call for technical assistance.	You have installed an expired measurement cartridge, a used measurement cartridge, or you installed the measurement cartridge without using the prompted method. 1. Touch **Cancel**. View the events log on the Status screen for the M Cartridge Not Valid message. 2. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual* to replace both cartridges. 3. If the message appears again, call for technical assistance.
After installing a new measurement cartridge and closing the door, the door opens and a message appears indicating that the measurement cartridge was not installed correctly.	During installation, the measurement cartridge was not pushed in firmly enough to lock the cartridge in place completely. Reinstall the cartridge. 1. Push firmly at the center of the cartridge, on the dot, until the cartridge locks in place. 2. If the measurement cartridge needs replacing message appears, the cartridge may still not be installed correctly or the system may have a problem. Call for technical assistance.

(Continued)

Replacing the AutomaticQC Cartridge

Use the following table to identify the cause of problems that occur when replacing the AutomaticQC cartridge.

Problem	Probable Cause and Corrective Action
The AutomaticQC cartridge does not eject from the system after you touch Replace.	The connector was not completely opened. 1. Slide the connector to the right as far as possible. 2. Touch **Replace** again. 3. If the message appears again, record the message and call for technical assistance.
After installing a new cartridge and closing the connector, nothing happens.	The connector was not completely closed. Slide the connector to the left as far as possible.
After installing a new cartridge and closing the connector, a message appears indicating that the cartridge was not installed correctly.	The AutomaticQC cartridge was not pushed in firmly enough to lock it in place. 1. Push firmly again on the raised dots until you hear the cartridge lock in place. 2. Touch the **Continue** button.
While attempting to replace the cartridge, you cannot complete the procedure and you need to analyze patient samples.	1. Wait on the Replacing AutomaticQC Cartridge screen for approximately 10 minutes until the **Return** button appears. 2. Touch the **Return** button to access the Status screen. 3. Access Setup and turn the AutomaticQC option off. *Refer to Selecting AutomaticQC Analysis Options* in Section 6 in the *Rapidpoint 400 Series Operator's Manual.* 4. Analyze patient samples if required. 5. Turn AutomaticQC on again and replace the AutomaticQC cartridge.

Bar Codes

Use the following table to identify the cause of problems with bar codes or the bar code scanner.

Problem	Probable Cause and Corrective Action
Nothing appears when scanning the bar codes.	The bar code is turned off in Setup, the wrong symbology was selected, or the format was not specified. Refer to *Selecting Bar Code Options* in Section 6 in the *Rapidpoint 400 Series Operator's Manual.* The bar code scanner was not connected to the system correctly. Reconnect the bar code scanner. Refer to *Connecting the Bar Code Scanner.* The system does not recognize the bar code. Scan only bar codes specified in Setup.
When scanning the patient ID or the accession number, the bar code appears in the wrong field on the screen.	The wrong field was selected when you scanned the bar code. Touch the button for the appropriate field, or touch the field, and then scan the corresponding bar code. For example, touch **Patient ID** and then scan the patient ID bar code.
When scanning the patient ID or the accession number, the data entered on the screen does not match the bar code.	If the field already contains data when you scan, the system adds the bar code data to the existing data. 1. Ensure that the field is empty before scanning the bar code. 2. Touch the field and then touch **Clear** to delete the data in the field. 3. If the problem persists, ensure that the bar code format is correctly defined for patient and accession number bar codes as described in *Selecting Bar Code Options* in Section 6 in the *Rapidpoint 400 Series Operator's Manual.*

(Continued)

Problem	Probable Cause and Corrective Action
The bar code scanner works intermittently, or data does not appear on the screen when you scan.	Faulty scanning technique, poor quality of the bar code print, or a loose cable connection to the port on the Rapidpoint 400 series system can cause poor scanner performance. 1. Use the correct scanning technique as described in *Scanning Technique* on page 172. 2. Evaluate the print quality of the bar code and bar code label as described in *Bar Code Quality* on page *172.* 3. Ensure that the bar code scanner is correctly connected to the Rapidpoint 400 series system. 4. Ensure that the bar code scanner is turned on and that the correct symbology and format for patient bar codes are selected as described in *Selecting Bar Code Options* in Section 6 in the *Rapidpoint 400 Series Operator's Manual.* If you use Interleaved 2 of 5 bar codes, ensure that you entered the correct bar code lengths for the bar codes that you use. 5. Ensure that you are scanning the correct bar code for the sample or the control.

(Continued)

Problem	Probable Cause and Corrective Action
The bar code scanner no longer scans bar codes that it scanned before.	Faulty scanning technique, poor quality of the bar code print, or loose cable connection to the port on the Rapidpoint 400 series system can cause poor scanner performance. The scanner may also need to be reset. 1. Use the correct scanning technique as described in *Scanning Technique*, page 172. 2. Evaluate the print quality of the bar code and bar code label as described in *Bar Code Quality*, page 172. 3. Ensure that the bar code scanner is correctly connected to the Rapidpoint 400 series system. 4. Ensure that the bar code scanner is turned on and that the correct symbology and format for patient bar codes are selected as described in *Selecting Bar Code Options* in Section 6 in the *Rapidpoint 400 Series Operator's Manual.* If you use Interleaved 2 of 5 bar codes, ensure that you entered the correct bar code lengths for the bar codes that you use. 5. Ensure that you are scanning the correct bar code for the sample or the control. 6. Reset the bar code scanner as described in *Resetting the Bar Code Scanner*, page 172. **Service Solutions:** Perform service solutions only after all other corrective actions have been completed. 1. Replace the scanner. 2. Replace the rear interconnect board. 3. Replace the Main board. 4. Replace the UIP board.

Scanning Technique

Use the following technique to ensure that you operate the bar code scanner correctly:

- Hold the scanner at an angle to the bar code, not directly over the bar code and not touching it.
- Scan the entire bar code. Move the scanner to the distance that allows the beam to scan every bar and space.

Bar Code Quality

Ensure that the quality of the bar code label is acceptable. The ideal bar code label has clean, clear, straight, fine lines with high contrast between light and dark areas. A white background with black print provides the highest contrast.

Label quality can interfere with correct scanning. Avoid using labels with a highly laminated surface or with poorly printed bar codes, such as those with broken areas, smudges, or other irregularities. Environmental factors, such as exposure to dampness and ultraviolet light, can also damage the bar codes during storage or use.

Resetting the Bar Code Scanner

Reset the bar code scanner if the scanner no longer scans bar codes that it scanned before.

NOTE: Use this procedure only after performing all the corrective actions described in *Bar Codes* on page 169.

1. Scan the bar code shown below.

2. Shut down the system and then restart it as described in *Shutting Down the System* on page 256.

Printer

Problem	Probable Cause and Corrective Action
The printer does not print at all.	The printer is out of paper, the paper is reversed or jammed in the printer, or the printer is not turned on. 1. If the printer is out of paper, install a new roll of paper as described in *Replacing the Printer Paper* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.* 2. Ensure that the thermal paper is not reversed and that it is feeding correctly as described in *Replacing the Printer Paper* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.* 3. Ensure that the paper is not jammed. Clear the jam if one exists. 4. If you are unable to clear the paper jam, call for technical assistance. 5. Ensure that the printer is turned on as described in *Selecting Printing Options* in Section 6 in the *Rapidpoint 400 Series Operator's Manual.*
The printer is not printing correctly.	Replace the printer paper as described in *Replacing the Printer Paper* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.* **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Run the printer MIT. 2. Replace the Display/Printer assembly. 3. Replace the UIP board. 4. Replace the Main board.

Touch Screen

Problem	Probable Cause and Corrective Action
The screen is blank.	1. Ensure that the screen is adjusted to the correct viewing angle and brightness. Grasp and squeeze the latch on top of the screen and tilt the screen to the correct viewing angle. 2. Ensure that the power switch is on. 3. Ensure that the power cord is connected to the system and to the electrical outlet. 4. Ensure that the fuses are not blown. If necessary, replace the fuses as described in *Replacing the Fuses* in *Replacing Components*.
The touch screen responds inconsistently to touches. For example, you must touch to the right or the left of an item to select it.	The touch screen requires calibration. Refer to *Calibrating the Touch Screen* in *Calibrations*. When relocating the system, a change in ambient temperature of greater than 5°C may cause the screen to become out of calibration. Calibrate the screen if required.
The touch screen does not respond to touches, or it responds erratically after calibrating the screen.	The touch screen was incorrectly calibrated. Call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Perform *Emergency Calibration of the Touch Screen* in *Calibrations*. 2. Replace the Display/Printer assembly. 3. Replace the UIP board. 4. Replace the Main board.

Communication

The communications error symbol appears on the Analysis and the Results screen.

Problem	Probable Cause and Corrective Action
An interfaced Rapidlink system or laboratory information system (LIS) does not communicate with the Rapidpoint 400 series system.	1. Ensure that the cable connecting the systems is tightly connected to each system. 2. Ensure that the cable is not damaged and that it is the correct cable for connecting the systems. 3. Ensure that the Rapidlink data management system or the LIS is correctly configured to communicate with the Rapidpoint 400 series system. 4. Ensure that the Rapidpoint 400 series system is correctly configured to communicate with the Rapidlink system or the LIS and that the connection is turned on. Refer to *Connecting to a Computer System*, for more information about the communication settings. 5. Send the sample results or calibration data again from the Rapidpoint 400 series system by recalling the results and touching the **Print** button. 6. If communication is not successful, record the system message from the events log and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Ensure the communications setup information is correct. 2. Look at the LED at the network connector on the UIP board to ensure the lights are on. 3. Check cables and connectors. 4. Replace the rear interconnect board. 5. Replace the UIP board.

Viewing the Events Log

Use this procedure to view the events log, which lists system messages that provide information about system activities and error conditions.

You can view the events log two ways:

- At the Status screen, you can view unresolved system messages that provide information about current system conditions.
- From the Recall menu, you can view a historical log of current and previous system conditions.

To view current system messages at the Status screen:

1. If prompted, enter your password, the service password, or the password of the day.
2. Touch the **Status** button.

   The events log shows the list of messages about current system conditions, such as a message for a sensor that is out of calibration.

   Refer to *System Messages* on page 177, for more information about each message.
3. Touch the up and down arrows to view additional messages.
4. Touch the **Continue** button to return to the Analysis screen.

To view a historical list of system messages:

1. If prompted, enter your password, the service password, or the password of the day.
2. Touch the **Recall** button.
3. Touch **Events Log.**

   The system displays a historical list of system messages. The list contains the messages for up to 250 system events.

   Refer to *System Messages* on page 177, for more information about each message.
4. Touch the up and down arrows to view additional messages.
5. Touch the **Continue** button twice to return to the Analysis screen.

System Messages

The system messages can appear as follows:

- Messages can appear in a message box over the Analysis screen or over the Status screen. In a Restricted system, some messages can appear at the Sign-In screen.
- Messages can appear in the events log at the Status screen or in the events log that you access from the Recall menu. For example, after you replace a depleted wash/waste cartridge, the message remains in the events log that you access from the Recall menu.

The following table lists the messages in alphabetical order.

Message	Probable Cause and Corrective Action
AQC Cartridge Expired	The AQC cartridge has exceeded its operating life or is depleted. Refer to *Replacing the AutomaticQC Cartridge* on page 168 to replace the cartridge.
AQC Cartridge Not Valid	The system detects that the AQC cartridge just installed has exceeded its Install by date, that a used cartridge was reinstalled, or that the cartridge was installed without using the prompted method that you begin from the Status screen. The system is unable to use the cartridge. Refer to *Replacing the AutomaticQC Cartridge* on page 168 to replace the cartridge.
AQC Connector is Open	The system detects that the connector on the AQC cartridge is open. Slide the connector to the left to close it.
AQC Pending	Appears 15 minutes before the time of the next scheduled AutomaticQC. The time remaining until AutomaticQC begins appears with the message. Touch the **QC!** button to start AutomaticQC sooner. The message disappears when AutomaticQC begins.
Additional Cal Required	A sensor experienced a calibration error, and the system repeated the calibration to attempt to correct the error. This message also appears in the printed calibration report.

(Continued)

Message	Probable Cause and Corrective Action
Additional Wash Required	A change in transmittance was detected by the optical clarity test that occurs during the wash after a CO-ox sample analysis. The system repeated the wash to attempt to correct the error. If the repeated wash fails the clarity test again, the system displays a D70 Optical Error: 2 message. Refer to the solutions for a D70 Optical Error on page 205. **Service Solutions** Refer to service solutions for D70 Optical Error: 2.
Analysis is turned off by a remote computer.	The Rapidlink data management system or the LIS connected to the Rapidpoint 400 series system has turned analysis functions off for the Rapidpoint 400 series system. You can perform other tasks, such as recalling results, replacing cartridges, and accessing the Setup options. Contact your system supervisor for assistance if you need to analyze samples. The Analysis Turned Off message appears in the events log.
Bubbles in the Sample. The system cannot complete analysis. Touch Continue to begin the sequence to clear the system. Replace the sample port when prompted.	The system cannot analyze the current patient or QC sample because it detects bubbles in the sample. This can occur if the sample contained bubbles when you introduced it into the sample port or if an obstruction is present. The Bubbles in Sample message appears in the events log. Introducing the jagged end of capillary tubes into the sample port can also cause this problem. The sharp edges of capillary tubes can damage the sample port, affecting sample aspiration. 1. Touch **Continue** to remove the message, then replace the sample port when prompted. Refer to *Replacing the Sample Port* in *Replacing Components*. 2. If prompted, replace the cartridges as described in *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual*. 3. To avoid bubbles in patient samples, ensure that you use the recommended collection, storage, handling, and mixing techniques as described in Section 1, *Collecting Patient Samples* in the *Rapidpoint 400 Series Operator's Manual*. For QC samples, ensure that you use the storage and handling techniques recommended by the manufacturer.

(Continued)

Message	Probable Cause and Corrective Action
	4. Analyze the sample again, ensuring that the sample has no bubbles before introducing it into the sample port. Checking for bubbles is especially important for samples introduced from capillary tubes. If you are analyzing a capillary sample, ensure that you introduce the fire-polished (smooth) end of the capillary tube into the sample port. 5. When introducing the sample, introduce the sample device into the sample port as shown on the screen.
Cal Overdue	Calibration was delayed beyond the maximum calibration interval. The system must perform a calibration before you can analyze samples.
Cal Not Done	The system was unable to perform a calibration until after the next scheduled calibration. This can occur if the system is left idle in a state where it cannot perform calibrations. The system cannot perform calibrations when the wash/waste cartridge is expired, during diagnostic tests, and during the procedure for removing obstructions. When this condition occurs, the Wait screen appears while the system performs an extended calibration.
Cal Pending	Appears 2 minutes before the time of the next scheduled calibration. The time remaining until the calibration begins appears with the message.
COox Chamber Temp Error	The system detects that the temperature of the CO-ox sample chamber is outside the acceptable measurement range. This message can occur when a new measurement cartridge is warming up, when the system is warming up after being shut down, and when the door remains open for too long. **NOTE:** The system can measure samples and report results for parameters that are still available. 1. Wait until the system removes the message from the Status screen before analyzing samples. 2. If the message appears again, record the message and call for technical assistance.

(Continued)

Message	Probable Cause and Corrective Action
	Service Solutions Perform service solutions only after all other corrective actions have been completed. 1. Perform the temperature test with the measurement cartridge installed. 2. Check all cables and connections to and from the sample chamber interface assembly. 3. Perform the temperature test again. 4. Replace the cartridge. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual* if you want to replace the cartridges. 5. Replace the sample chamber interface assembly. 6. Perform the temperature test again. 7. Replace the connector block.
COox Sample Temp Out of Range	The system detects that the temperature of the sample is beyond the acceptable measurement range at the end of sample analysis. This message usually appears if you analyze a sample before the CO-ox sample chamber reaches its normal operating temperature. The system does not report the sample results. Analyze the sample again. If the message appears again, record the message and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Perform the temperature test with the measurement cartridge installed. 2. Check all cables and connections to and from the sample chamber interface assembly. 3. Perform the temperature test again. 4. Replace the cartridge. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual* if you want to replace the cartridges. 5. Replace the sample chamber interface assembly. 6. Perform the temperature test again. 7. Replace the connector block.

Message	Probable Cause and Corrective Action
D2 Excessive Drift Qualifiers: pH, pO_2, pCO_2, Na^+, K^+, Ca^{++}, Cl^-, Glu	The system turned the parameter identified in the message off because the sensor exceeded calibration limits. 1. Perform a 2-point calibration. 2. If the parameter fails the calibration, wait as subsequent calibrations may make the parameter available again. 3. If the parameter remains out of calibration, replace the cartridges to make the parameter available for analysis. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual* if you want to replace the cartridges. 4. If the message appears again, record the message and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. If cartridge replacement does not solve the problem: 1. Use the measurement cartridge simulator to perform the sensor test. 2. Replace the connector block. 3. Replace the cartridge interface module.
D2 Excessive Drift: Hct	The system turned the parameter identified in the message off because the sensor exceeded calibration limits. 1. Perform a full calibration. 2. If the parameter fails the calibration, wait as subsequent calibrations may make the parameter available again. 3. If the parameter remains out of calibration, replace the cartridges to make the parameter available for analysis. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual* if you want to replace the cartridges. 4. If the message appears again, record the message and call for technical assistance.

(Continued)

Message	Probable Cause and Corrective Action
	Service Solutions Perform service solutions only after all other corrective actions have been completed. If cartridge replacement does not solve the problem: 1. If many drift errors occur for all reference sensors check the door grounding connection. Inspect and tighten the ground wire connection. Noise can be due to bad grounding of the shield or the Mux cable. 2. Check that the resistance of the door ground is less than 2 ohms. 3. Use the measurement cartridge simulator to perform the sensor test. 4. Replace the connector block.
D2 Excessive Drift: tHb	The system turned the tHb parameter off because the CO-ox module exceeded calibration limits. 1. Perform a full calibration. 2. If the parameter remains out of calibration, replace the cartridges to make the parameter available for analysis. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual* if you want to replace the cartridges. 3. If the message appears again, record the message and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Repeat full calibrations. 2. If the error continues, check valve alignment for the measurement cartridge. Refer to *Testing the Measurement Cartridge Valve Alignment* on page 244. 3. If the valve is out of alignment, replaced the cartridge interface assembly. 4. Replace the measurement cartridge.

D2 Qualifier Descriptions

D2 occurs only if the sensor passes slope and offset requirements (D3 and D4) during the current calibration operation. A pH error causes a D2 for pCO_2.

D2 is detected during calibrations when:

- The drift is calculated and limit-checked for both calibration points.
- Inherent noise or instability is determined during the measurement.
- A special case exists for pCO_2 which reports a D2 error when a drift error occurs for pH and a D3 or D4 is not detected for pCO_2.

Drift errors are cleared by the next calibration if drift is within limits or the channel is disabled through Setup. The channel returns to the calibration state when the system completes a successful 1- or 2-point calibration.

Message	Probable Cause and Corrective Action
D3 Slope Error: pH, pO_2, pCO_2, Na^+, K^+, Ca^{++}, Cl^-, Glu	The system turned the parameter identified in the message off because the sensor exceeded calibration limits. 1. Perform a 2-point calibration. 2. If the parameter fails the calibration, wait as subsequent calibrations may make the parameter available again. 3. If the parameter remains out of calibration, replace the cartridges to make the parameter available for analysis. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual* if you want to replace the cartridges. 4. If the message appears again, record the message and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. If cartridge replacement does not solve the problem: 1. Use the measurement cartridge simulator to perform the sensor test. 2. Replace the connector block. 3. Replace the cartridge interface module.
D3 Slope Error: Hct	The system turned the parameter identified in the message off because the sensor exceeded calibration limits. 1. Perform a full calibration. 2. If the parameter fails the calibration, wait as subsequent calibrations may make the parameter available again. 3. If the parameter remains out of calibration, replace the cartridges to make the parameter available for analysis. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual* if you want to replace the cartridges. 4. If the message appears again, record the message and call for technical assistance.

(Continued)

Message	Probable Cause and Corrective Action
	Service Solutions Perform service solutions only after all other corrective actions have been completed. If cartridge replacement does not solve the problem: 1. Use the measurement cartridge simulator to perform the sensor test. 2. Replace the connector block. 3. Replace the cartridge interface module.
D3 Slope Error: tHb	The system turned the tHb parameter off because the CO-ox module exceeded calibration limits. 1. Perform a full calibration. 2. If the parameter remains out of calibration, replace the cartridges to make the parameter available for analysis. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual* if you want to replace the cartridges. 3. If the message appears again, record the message and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. If cartridge replacement does not solve the problem: 1. Repeat full calibrations. 2. If the error continues, check valve alignment for the measurement cartridge. Refer to *Testing the Measurement Cartridge Valve Alignment* on page 244. 3. If the valve is out of alignment, replaced the cartridge interface assembly. 4. Replace the measurement cartridge.

D3 Qualifier Descriptions

D3 occurs during calibration operations when the slope is outside the predefined range for the indicated channel. A pH D3 error causes D3 for pCO_2.

Slope errors are cleared by the next calibration if slope is within limits or the channel is disabled through Setup. The channel returns to the calibration state when the system completes a successful 1- or 2-point calibration that clears D2, D3, or D4.

Message	Probable Cause and Corrective Action
D4 Offset Error: pH, pCO_2, Na^+, K^+, Ca^{++}, Cl^-, Hct	The system turned the parameter identified in the message off because the sensor exceeded calibration limits. 1. Perform a 1-point calibration. 2. If the parameter fails the calibration, wait as subsequent calibrations may make the parameter available again. 3. If the parameter remains out of calibration, replace the cartridges to make the parameter available for analysis. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual* if you want to replace the cartridges. 4. If the message appears again, record the message and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. If cartridge replacement does not solve the problem: 1. Use the measurement cartridge simulator to perform the sensor test. 2. Replace the connector block. 3. Replace the cartridge interface module.
D4 Offset Error: Glu, pO_2	The system turned the parameter identified in the message off because the sensor exceeded calibration limits. 1. Perform a 2-point calibration. 2. If the parameter fails the calibration, wait as subsequent calibrations may make the parameter available again. 3. If the parameter remains out of calibration, replace the cartridges to make the parameter available for analysis. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual* if you want to replace the cartridges. 4. If the message appears again, record the message and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. If cartridge replacement does not solve the problem: 1. Use the measurement cartridge simulator to perform the sensor test. 2. Replace the connector block. 3. Replace the cartridge interface module.

D4 Qualifier Descriptions

D4 occurs during all calibration operations for pCO_2, pH, Na^+, K^+, Ca^{++}, Cl^- and Hct. A special case exists for pCO_2 which reports a D4 error if an offset error for pH is detected and a D3 is not detected for pCO_2. D4 is not reported with D3 for the same sensor and same calibration point.

D4 for pO_2 occurs only during a 2-point calibration operation. D4 for Glu occurs during a 2-point calibration operation and a wash measurement.

Offset errors are cleared by the next calibration if slope is within limits or the channel is disabled through Setup. The channel returns to the calibration state when the system completes a successful 1- or 2-point calibration that clears the D2, D3, or D4.

Message	Probable Cause and Corrective Action
D21 Processing Error	A system error occurred. 1. When prompted, shut down the system as described in *Shutting Down the System* on page 256, wait 10 seconds, and then turn the system on. 2. If the message appears again, record the message and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. If cartridge replacement does not solve the problem: 1. Check that the resistance of the door ground is less than 2 ohms. Inspect and tighten the ground wire connection. 2. Replace the Main board. 3. Replace the power supply.

D21 Qualifier Descriptions

D21 occurs during an interprocessor data link failure and is a fatal error because it is not recoverable. This error can occur at any time and is caused by internal or external operations.

D21 is cleared by shutting down the system and then restarting.

Message	Probable Cause and Corrective Action
D23 Reagent Error: 1-8 or 10-13 Qualifiers: 1 Not used 2 No WashCal detected at FD1 3 No 200Cal detected at FD1 4 No ZeroCal detected at FD1 5 No GHCal detected at FD1 6 Not used 7 No Wash segment detected at FD1 or FD2 8 No Wash segment detected at FD1 or FD2 10 No WashCal detected at FD2 11 No 200Cal detected at FD2 12 No ZeroCal detected at FD2 13 No GHCal detected at FD2	The system detects that the flow of one or more reagents is inadequate or incorrect. The system automatically performs a wash or a calibration to attempt to correct the problem. If the system cannot correct the problem, it prompts you to replace the wash/waste cartridge or to replace both cartridges. 1. If prompted, replace the cartridges as indicated in the message. If you need to replace only the wash/waste cartridge, refer to *Replacing the Wash/Waste Cartridge* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.* If you need to replace both cartridges, refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.* 2. If the message appears again, record the message and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Use the cartridge simulator to test the pump flow rate and the valve alignment. Refer to *Testing the Pump Flow* on page 242 for information about the cartridge simulator. 2. Perform the Pump, Valve, and Measurement tests for all D23 qualifiers. **NOTE:** Refer to *Replacing the Connector Block* and *Replacing the Pump Motors and Roller Cages* in *Replacing Components*, to prepare the interface frame for the replacement assembly. 1. Replace the interface module. 2. Replace the roller cages. 3. Replace the motors.

(Continued)

Message	Probable Cause and Corrective Action
D23 Reagent Error: 9 Qualifier: 9 No foam Wash detected at FD1	The system detects that the flow of a reagent is inadequate or incorrect. The system automatically performs a wash or a calibration to attempt to correct the problem. If the system cannot correct the problem, it prompts you to replace the sample port. If the problem still exists, it prompts you to replace the cartridges. 1. When prompted, replace the sample port as described in *Replacing the Sample Port* in *Replacing Components.* 2. If prompted, replace the cartridges as described in *Replacing the Measurement* and *Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.* 3. If the message appears again, record the message and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Use the cartridge simulator to test the pump flow rate and the valve alignment. Refer to *Testing the Pump Flow* on page 242 for information about the cartridge simulator. 2. Perform the Pump, Valve, and Measurement tests for all D23 qualifiers. **NOTE:** Refer to *Replacing the Connector Block* and *Replacing the Pump Motors and Roller Cages* in *Replacing Components*, to prepare the interface frame for the replacement assembly. 1. Replace the roller cages. 2. Replace the motors. 3. Replace the connector block. 4. Replace the interface module.

D23 Qualifier Descriptions

D23 errors are associated with improper reagent loading and may be confused with sample related errors because these errors are characterized by internal fluids. D23 errors are cleared by a successful calibration, wash, or by replacing the W/W cartridge or Measurement cartridge.

Qualifier 7 occurs only during a wash following any calibration (cal_wash_seq) and supersedes other D23 errors. If the errors persist, all sensors are set to Out-Of-Cal. If a replacement wash/waste cartridge fails with a D40, the system prompts you to replace the wash/waste cartridge. If this replacement fails with a D40, the system prompts you to replace the measurement cartridge.

Qualifier 2 occurs during 2-point and FULL 2-point calibration reagent loads (aspreag1_seq).

Qualifier 3 occurs 1-point, 2-point and FULL 2-point calibration reagent loads (aspreag_seq).

Qualifier 4 occurs during 2-point and FULL 2-point calibration reagent loads (aspreag1_seq).

Qualifier 5 occurs during FULL 2-point calibration reagent loads (aspreag1_seq).

Qualifier 7 occurs during wash following any calibration (cal_wash_seq).

Qualifier 8 occurs during wash following any sample (normal_wash_seq).

Qualifier 9 occurs during wash following any sample (normal_wash_seq).

Qualifier 10 occurs during 2-point and FULL 2 point calibration reagent loads (aspreag2_seq).

Qualifier 11 occurs during 1-point, 2-point and FULL 2-point calibration reagent loads (aspreag2_seq).

Qualifier 12 occurs during 2-point and FULL 2-point calibration reagent loads (aspreag2_seq).

Qualifier 13 occurs during Full 2-point calibration reagent loads (aspreag2_seq).

Message	Probable Cause and Corrective Action
D24 AQC Material Error	The system detects that the flow of one or more quality control materials is inadequate or incorrect. The system automatically repeats the QC sample. If the system cannot correct the problem, it prompts you to replace the AutomaticQC cartridge. 1. If prompted, replace the cartridge as indicated in the message. *Replacing the AutomaticQC Cartridge* on page 168. 2. If the message appears again, record the message and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Remove the AutomaticQC cartridge and perform the AQC valve test and observe the valve moving. 2. Use the AutomaticQC cartridge simulator to test the valve alignment. Refer to *Using the AutomaticQC Cartridge Simulator* on page 246 for information on the cartridge simulator. 3. Replace the AQC frame assembly.

D24 Qualifier Descriptions

A D24 error is detected while positioning, delivering or measuring AQC material, and may be caused by the following conditions:

- AutomaticQC material is depleted
- Obstruction in the fluidic path of the Measurement or AutomaticQC cartridge
- Disconnected AutomaticQC cartridge connector or reagent bag tubing
- Bubbles or short sample in the AutomaticQC material during positioning to FD2
- AutomaticQC material not detected at FD1
- Obstruction in the fluidic path of the AutomaticQC cartridge

D24 errors are cleared by a successful AutomaticQC cartridge replacement or by turning off the AQC feature in Setup.

Message	Probable Cause and Corrective Action
D33 Valve Error: 1 Qualifiers: 1 Measurement cartridge	The system detects a problem with the valve inside the measurement cartridge. 1. When prompted, shut down the system as described in *Shutting Down the System* on page 256, wait 10 seconds, and then turn the system on. 2. If the message appears again, record the message, including the qualifier, and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Access Diagnostics and remove the measurement cartridge. 2. Check the alignment using the gauge. 3. Shut down the system and then turn the system on again. 4. If the D33 error occurs again, replace the cartridge interface assembly.

D33 Qualifier Descriptions

D33 Valve Error 1 can occur during probe movement for most instrument operations.

A D33 Valve Error: 1 is triggered if the valve fails to travel to the fully extended position from the sample entry port to the measurement cartridge and indicates a valve drive failure, misalignment, or a position sensor error.

The D33 Error 1 is detected:

- during valve movement
- during the M Valve diagnostic test
- while the system is powering up

Message	Probable Cause and Corrective Action
D33 Valve Error: 2 Qualifiers: 2 AutomaticQC cartridge	The system detects a problem with the valve inside the AutomaticQC cartridge either during cartridge replacement or during sample analysis. If the problem occurs while trying to replace the AutomaticQC cartridge: 1. Check that the connector is completely open and then touch **Replace** to try and eject the cartridge. 2. If the message appears again, record the message, including the qualifier, and call for technical assistance. If the problem occurs during AutomaticQC analysis: 1. Shut down the system as described in *Shutting Down the System* on page 256, wait 10 seconds, and then turn the system on. 2. If the message appears again, record the message, including the qualifier, and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Remove the AutomaticQC cartridge and perform the AQC valve test and observe the valve moving. 2. Use the AutomaticQC cartridge simulator to test the valve alignment. Refer to *Using the AutomaticQC Cartridge Simulator* on page 246 for information on the cartridge simulator. 3. Replace the AQC frame assembly.

D33 Qualifier Descriptions

D33 Valve Error: 2 is triggered if the AQC cartridge does not eject in the absence of a valve drive failure, and if the valve fails to move to a certain position due to a drive valve failure or a latch failure.

When the AQC cartridge does not eject, the D33 is detected:

- after closing the cartridge connector when replacing the cartridge
- when the cartridge fails to eject from the system
- during power up

When the valve fails to move, the D33 is detected:

- during AutomaticQC
- during the AQC Valve diagnostic test
- during a smart AQC prime
- during power up

Message	Probable Cause and Corrective Action
D35 Electronics Error: 1-13 Qualifiers: 1 DAS error 2 Signal processing error 4 -12V out of range 5 +12V out of range 6 +24V out of range 7 24V power control error 9 System noise error 10 Main board error 11 DAS bus error 13 Pump motor error	An error has occurred in the electronic components. 1. When prompted, shut down the system as described in *Shutting Down the System* on page 256, wait 10 seconds, and then turn the system on. 2. If the message appears again, record the message, including the qualifier, and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Perform the test to measure the 5 volt supply. Refer to *Replacing the Main Board,* in *Replacing Components.* 2. Check all cables and connections. 3. If a D35: 2 or 9 occurs, check the ground on the front door, replace the cartridge interface module. 4. Replace the Main board.
D35 Electronics Error: 14 Qualifier: 14 Door lock	The system detects a problem with the door. 1. Ensure that nothing is blocking the door from opening. 2. When prompted, shut down the system as described in *Shutting Down the System* on page 256, wait 10 seconds, and then turn the system on. 3. If the message appears again, record the message, including the qualifier, and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Test the door using the **Door** button in Diagnostic tests. 2. Check cable connections. 3. Replace the door lock assembly.

D35 Qualifier Descriptions

D35 occurs during power-up initialization (PUI), before calibrations, or during an MIT (manually initiated test). A D35 error indicates an electronics hardware failure.

Qualifiers 1, 2, 4, 5, and 9 occur during PUI before calibrations.

Qualifiers 6 and 7 occur during PUI only.

Qualifier 10 occurs during PUI and some associated faults during normal operations.

Qualifier 11 occurs any time during data acquisition when the system fails any tests that check the DAS functionality of the Main board.

Qualifier 13 occurs during washes and pump MITs.

Qualifier 14 occurs if the door opens without the door lock being deactivated by the system, and if the door fails to open after touching the Continue button on the message indicating the system is unable to open the door.

Message	Probable Cause and Corrective Action
D38 Temp Error: 1 Qualifiers: 1 Temperature over range	An error has occurred in the temperature control system because of a problem with the fan. 1. Ensure that the fan is working and nothing is blocking the flow of air. 2. Inspect the air filter and replace it if required. Refer to *Replacing the Air Filter* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.* 3. Shut down the system and then restart is as described in *Shutting Down the System* on page 256. 4. If prompted to call for service, record the message including the qualifier, and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Check that the filter is not blocked or that nothing is blocking air to the main board. 2. Check cables and connections to the fan. 3. Check that the fan is operating, and replace, if required.
D38 Temp Error: 2–13	An error has occurred in the temperature control system. This error can occur if a component in the temperature control system has failed. The error can also occur if you operate the system at ambient temperatures beyond the operating temperature.
Qualifiers: 2 Sample Temperature Sensor Failure: Thermistor is shorted or open. Temperature is <10°C or > 50°C.	1. Wait while the system attempts to correct the problem. 2. Operate the system in an environment with ambient temperature within 15 to 32°C. 3. If prompted, shut down the system and then restart it as described in *Shutting Down the System* on page 256.

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Message	Probable Cause and Corrective Action
3 Block Heater Sensor Failure: Thermistor is shorted or open. Temperature is <10°C or > 50°C. 4 Block Heater failure. 5 Block temperature or setpoint out of range. 6 Pre-heater sensor failure.Thermistor is shorted or open, temperature is < 10°C or > 50°C. 12 Unrecoverable temperature error.	If prompted to call for service, record the message, including the qualifier, and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Perform the Temperature test. 2. Check cables and connections to the cartridge interface assembly and the Main board. 3. Replace the connector block. 4. Replace the cartridge interface assembly. 5. Replace the Main board.

D38 Qualifier Descriptions

D38 indicates failure of the temperature control system. The failure is most likely due to hardware, although it may be caused by ambient conditions that prevent the software from controlling the heaters.

There are two categories of D38 errors: fatal and non-fatal. Non-fatal errors include qualifiers 4 and 5; fatal errors include 1, 2, 3, 6 and 12.

NOTE: Non-fatal D38 errors and a Temp Not Ready occurrence force cartridge initialization after returning from Diagnostics or upon closing the door.

For non-fatal errors, the system attempts to reenable the temperature control every 15 minutes for up to an hour. If the system does not recover, a D38:12 is displayed.

If during a non-fatal temperature error no measurement cartridge is installed, then the measurement cartridge replacement procedure will preempt the temperature handling.

All D38 types except D38:1 are detected by the temperature control system software which runs once per second. D38:1 is detected on startup, during a calibration, and when another thermal error is detected.

Message	Probable Cause and Corrective Action
D39 Obstruction	The system detects a problem, such as an obstruction or a sample not detected, and prompts you to replace the sample port. If the system is unable to clear the obstruction, it prompts you to replace the cartridges. 1. When prompted, replace the sample port as described in *Replacing the Sample Port* in *Replacing Components.* 2. If prompted, replace the cartridges as described in *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.* 3. If the message appears again, record the message and call for technical assistance. **Service Solutions** If cartridge replacement does not solve the problem, view the events log for errors that may be causing the problem.

D39 Qualifier Description

D39 occurs when fluids cannot be moved or positioned from the sample device through the sample chamber past FD2.

D39 occurs during patient sample and QC operations. D39 is cleared by the clot removal procedure.

Message	Probable Cause and Corrective Action
D40 Wash Not Detected	The system detects that the fluidic components of a newly installed wash/waste cartridge have failed. The system prompts you to replace the wash/waste cartridge or to replace both cartridges. 1. When prompted, replace the cartridges as indicated in the message. If you need to replace only the wash/waste cartridge, refer to *Replacing the Wash/Waste Cartridge* in Section 3 in the *Rapidpoint 400 Series Operator's Manual*. If you need to replace both cartridges, refer to *Replacing the Measurement and Wash/ Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.* 2. If the message appears again, record the message and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. If cartridge replacement does not solve the problem: **CAUTION:** Before removing the measurement cartridge, ensure that any tests not requiring removal of the measurement cartridge are performed. Once a measurement cartridge is removed, if reinstalled it is likely to fail within a few days. To verify repairs, you may reinstall the measurement cartridge while remaining in Diagnostics. A new cartridge *must* be installed before leaving the customer site. 1. Remove the measurement cartridge and push on the pumps to ensure the springs are in place. Perform the pump tests and observe the pumps moving. 2. Use the measurement cartridge simulator to test the valve alignment, test FD 1 and 2, and perform the measurement test. Refer to *Using the Measurement Cartridge Simulator* on page *240* for information on the cartridge simulator. 3. Replace the roller cages. 4. Replace the motors. 5. Replace the connector block. 6. Replace the cartridge interface module.

D40 Qualifier Descriptions

D40 occurs when fluid delivery from a newly installed measurement or wash/waste cartridge fails.

D40 is detected during the priming of the wash/waste cartridge. A D40 is cleared by replacing the wash cartridge or by replacing both cartridges.

Message	Probable Cause and Corrective Action
D41 No AQC Material Detected	The system detects that the fluidic components of a newly installed AutomaticQC cartridge have failed. The system prompts you to replace the AutomaticQC cartridge. 1. When prompted, replace the cartridge as indicated in the message. Refer to *Replacing the AutomaticQC Cartridge* on page 168. 2. If prompted to replace the measurement cartridge, replace the cartridges as described in *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.* 3. If the message to replace the AutomaticQC cartridge appears again, record the message and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Remove the AutomaticQC cartridge and perform the AQC valve test and observe the valve moving. 2. Use the AutomaticQC cartridge simulator to test the valve alignment. Refer to *Using the AutomaticQC Cartridge Simulator* on page 246 for information on the cartridge simulator. 3. Replace the AQC frame assembly.

D41 Qualifier Descriptions

D41 occurs when the system detects an error at FD1 while delivering AutomaticQC material from a newly installed AutomaticQC cartridge.

A D41may be detected because of the following conditions:

- AutomaticQC material is depleted or AQC bag is not pierced
- Obstruction in the fluidic path of the Measurement or AutomaticQC cartridge
- Disconnected AutomaticQC cartridge connector or reagent bag tubing
- Bubbles or short sample in the AutomaticQC material during positioning to FD2

- AutomaticQC material not detected at FD1
- Obstruction in the fluidic path of the measurement or AutomaticQC cartridge

A D41 is detected during the priming of an AutomaticQC cartridge. D41 is cleared by a successful AutomaticQC cartridge replacement, turning off AQC in Setup, or replacing both the measurement and waste/wash cartridges.

Message	Probable Cause and Corrective Action
D60 Communications Error Qualifiers: none	The system detects a data communication error when trying to communicate with the Rapidlink data management system or the LIS. When this message occurs, a symbol also appears on the Analysis screen and on the results screen to indicate that the connection has failed. Refer to *Communication* on page 175, for more information. 1. Ensure that the cable connecting the systems is tightly connected to each system. 2. Ensure that the cable is not damaged and that it is the correct cable for connecting the systems. 3. Ensure that the Rapidlink data management system or the LIS is correctly configured to communicate with the Rapidpoint 400 series system. 4. Ensure that the Rapidpoint 400 *series* system is correctly configured to communicate with the Rapidlink system or the LIS and that the connection is turned on. Refer to *Connecting to a Computer System*, for more information about the communication settings. 5. Send the sample results or calibration data again from the Rapidpoint 400 *series* system by recalling the results and touching the **Print** button. 6. If the message appears again, record the message and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Ensure the communications setup information is correct. 2. Look at the LED at the network connector on the UIP board to ensure the lights are on. 3. Check cables and connectors. 4. Replace the rear interconnect board. 5. Replace the UIP board.

D60 Description

D60 occurs when the system detects a port communications error because of a connection problem, a data contents problem, or a failure of the UART.

D60 occurs during the start-up BIT when the port is tested, until individual port set up is completed. The error may be set by the port set-up BIT or during run-time as external communication tasks are performed.

Message	Probable Cause and Corrective Action
D70 Optics Error: 2 Qualifiers: 2 Zero Calibration Drift or 2 Consecutive Optical Clarity Drift Failures	The system detects a failure in the CO-ox optical components. **NOTE:** The system can measure samples and report results for parameters that are still available. 1. Perform a 2-point calibration. 2. If the parameter remains out of calibration, replace the cartridges to make the parameter available for analysis. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual* if you want to replace the cartridges. 3. If the message appears again, record the message and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Repeat 2-point calibrations. 2. Replace the measurement cartridge.
D70 Optics Error: 3, 4, 7, 11 Qualifiers: 3 tHb Analytical Detector Signal Out of Range 4 Excessive Noise for tHb Analytical Detector During Dark Measurement 7 Dark Current Out of Range for tHb Analytical Detector 11 Neon Lamp Failure	The system detects a failure in the CO-ox optical components. **NOTE:** The system can measure samples and report results for parameters that are still available. 1. Perform a 1-point calibration. 2. If the parameter fails the calibration, shut down the system as described in *Shutting Down the System*, page 256, wait 10 seconds, and then turn the system on. 3. If the parameter remains out of calibration, call for technical assistance.

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Message	Probable Cause and Corrective Action
	Service Solutions Perform service solutions only after all other corrective actions have been completed. For Error 3: 1. Repeat 2-point calibrations. 2. Verify the lamp is in the correct position. Remove and reinstall the halogen lamp. Then shut down and restart the system. 3. Verify that the rear cover does not shift the lamp position. Remove the rear cover, reinstall the lamp, and restart the system (with cover removed). 4. Replace the fiber bundle assembly. For Error 4 and 7: 1. Repeat 2-point calibrations. 2. Check that the screws are tight on the polychromator to ensure it is properly grounded. 3. Remove the polychromator ribbon cable and reattach. Power up the system. 4. If the error persists, replace the polychromator module. For Error 11: 1. Repeat 2-point calibrations. 2. Perform the Wavelength Calibration test without the cartridge. 3. Check all the connections to the fiber bundle assembly. 4. Replace the neon board assembly.
D70 Optics Error: 9, 12 Qualifiers: 9 Alignment EEPROM Read Error 12 Wavelength Shift Error	The system detects a failure in the CO-ox optical components. **NOTE:** The system can measure samples and report results for parameters that are still available. 1. Shut down the system as described in *Shutting Down the System*, page 256, wait 10 seconds, and then turn the system on. 2. If the message appears again, record the message, including the qualifier, and call for technical assistance.

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Message	Probable Cause and Corrective Action
	Service Solutions Perform service solutions only after all other corrective actions have been completed. For Error 9: 1. Repeat 2-point calibrations. 2. Check that the screws are tight on the polychromator to ensure it is properly grounded. 3. Remove the polychromator ribbon cable and reattach. Then restart the system. 4. If the error persists, replace the polychromator module. 5. Replace the Main board. For Error 12: 1. Perform the Wavelength Calibration test without the cartridge. 2. Replace the polychromator module.

D70 Qualifier Descriptions

D70 indicates a failure of the CO-ox optical measurement system. These failure modes encompass the illumination, optics, and measurement components. Most failures are electronic.

If the qualifier is . . .	Then . . .
2	detection occurs during each zero and normal wash when a repeated optical clarity test BIT failure occurs.
3	detection occurs during each zero, slope, full calibration, or CO-ox sample measurement after an analytical detector signal out of range BIT when the dark measurement exceeds the light measurement or the light measurement is saturated.
4	detection occurs during PUI, and for each zero, full calibration, and CO-ox sample measurement when excessive noise occurs for the tHb analytical detector during a dark noise BIT.
7	detection occurs during PUI, and for each zero, full calibration, and CO-ox sample measurement when dark current out of range occurs for the tHb analytical detector during a dark current BIT.
9	detection occurs during PUI when an EEPROM alignment error occurs during the alignment PROM BIT.
11	detection occurs during each calibration when a neon lamp failure occurs.
12	detection occurs during each calibration when the wavelength shift calculation fails the wavelength shift BIT.

Message	Probable Cause and Corrective Action
D73 COox Chamber Position Error	The system detects that the CO-ox sample chamber is unable to open or close correctly. Results for the current sample may be available if error occurred during the wash after the sample was analyzed. 1. When prompted, shut down the system as described in *Shutting Down the System*, page 256, wait 10 seconds, and then turn the system on. 2. If the message appears again, replace the cartridges. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 of the *Rapidpoint 400 Series Operator's Manual.* 3. If the message appears again, record the message and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Perform the Sample Chamber test using the measurement cartridge simulator. 2. Check that the optics head is moving in all directions properly. Reinstall the sample chamber interface assembly if necessary. 3. Check all cables and connections to and from the sample chamber interface assembly. 4. Replace the sample chamber interface assembly. 5. Replace the Main board.

D73 Qualifier Descriptions

D73 indicates a failure of the sample chamber to reach an open or closed position and occurs during PUI and each zero, full calibration, wash, and sample analysis.

The current sample is discarded unless detected after the measurement phase of the operation is completed. Sample measurements are not allowed until the error is cleared.

Message	Probable Cause and Corrective Action
D75 Lamp Failure	The system detects that the CO-ox halogen lamp has failed and has probably burned out. **NOTE:** The system can measure samples and report results for parameters that are still available. 1. Shut down the system as described in *Shutting Down the System*, page 256, wait 10 seconds, and then turn the system on. 2. If the message appears again, replace the lamp as described in *Replacing the CO-ox Lamp* in *Replacing Components*. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Remove the lamp and reinstall. Then perform the Lamp On/Off test. 2. Perform the Lamp Calibration. 3. Verify that the rear cover does not shift the lamp position. Remove the rear cover, reinstall the lamp, and restart the system (with cover removed). 4. Replace the halogen lamp and perform the Lamp Calibration. 5. Check the 5-volt supply. On the UIP board, test on the fuse (silver rectangle labeled F1 in the upper left corner) for 5.05 to 5.1 volts. 6. Check the fiber bundle connection to the Main board at U3. 7. Replace the Main board.

D75 Qualifier Descriptions

D75 indicates a failure of the CO-ox halogen lamp and occurs during PUI and each zero, full calibration, wash, and sample analysis.

CO-ox results are not reported for the current sample, but all other parameters in calibration report results.

CO-ox sample results are not reported until the error is cleared.

Message	Probable Cause and Corrective Action
D76 COox Electronics Error: Qualifiers: 2 Polycromator Board - Main Board Interface Error 3 ADC/DAC Error 4 readout Circuit Gain Error 5 Noisy ground 6 Lamp DAC Error 8 Lamp Control Error	An error has occurred in the CO-ox electronic components. **NOTE:** The system can measure samples and report results for parameters that are still available. 1. Shut down the system as described in *Shutting Down the System*, page 256, wait 10 seconds, and then turn the system on. 2. If the message appears again, record the message, including the qualifier, and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. For Error 2, 3, 4, 5: 1. Check the ground on the polychromator. Verify all screws are tight. 2. Remove the polychromator ribbon cable and reattach. Power up the system. 3. If the error persists, replace the polychromator module. 4. Replace the Main board. For Error 6: 1. Check power supply voltage. 2. Replace the Main board. For Error 8: 1. Check the fiber bundle connection to the Main board at U3. 2. Replace the Main board.

D76 Qualifier Descriptions

D76 indicates a failure of the CO-ox electronic hardware that occurs during PUI and during the various BITs listed in the following table.

CO-ox measurement is terminated for qualifiers 2, 6, and 8, blood gas data is still reported.

Qualifiers 3, 4, and 5 are not detected during sample measurement.

The CO-ox sample results are not reported until the error is cleared.

If the qualifier is . . .	Then . . .
2	detection is during PUI, zero, slope, and sample analysis when an error occurs during the Polychromator board and Main board BIT.
3	detection is during PUI, zero, and slope when an error occurs during the ADC Offset , ADC Calibration, or ADC-DAC Loopback BITs.
4	detection is during PUI when an error occurs during the Readout Circuit Gain BIT.
5	detection is during PUI, zero, and slope when an error occurs during the Ground Noise BIT.
6	detection is during PUI and when a temperature control error occurs during Lamp DAC, or Lamp Calibration and Voltage BIT.
8	detection is during PUI, zero, slope, and sample analysis when an error occurs during the Lamp On BIT.

Message	Probable Cause and Corrective Action
D77 Coox Temperature Error	An error has occurred in the CO-ox temperature control components. This error can occur if a temperature control component has failed, or if the system is operated at ambient temperatures beyond the operating temperature. **NOTE:** The system can measure samples and report results for parameters that are still available. 1. Wait while the system attempts to correct the problem. 2. Operate the system in an environment with ambient temperature within 15 to 32°C. 3. If the error continues, replace the cartridges to make the tHb parameter available for analysis. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual* if you want to replace the cartridges. 4. If prompted to call for service, record the message, including the qualifier, and call for technical assistance.

Message	Probable Cause and Corrective Action
	Service Solutions Perform service solutions only after all other corrective actions have been completed. 1. Perform the temperature test with the measurement cartridge simulator installed. Repeat test and look for temperature increase. 2. If temperature increases over time, replace the measurement cartridge. 3. If temperature fails to increase, check cables and connections to and from the cartridge interface assembly. 4. Repeat temperature test. 5. Replace the sample chamber interface assembly. 6. Repeat temperature test. 7. Replace connector block.

D77 Qualifier Descriptions

D77 indicates a CO-ox sample chamber temperature error is detected if:

- during shutdown and restart of the thermal system, the measured temperature of the CO-ox sample chamber is beyond the range of 0.7 to 50°C.
- during normal operation when more than 15 minutes has elapsed since thermal system startup and

  the system is not currently running a fluidic operation and has not run one for 60 seconds, and

  the measurement cartridge door is closed, and

  the CO-ox sample chamber is beyond the range of 36.85 to 37.25°C.
- the error is generated if the temperature is beyond the range of 36.85 to 37.25°C and is still out of range 15 minutes after the temperature operational exception is detected.

CO-ox results are not reported, all other parameters in calibration report results.

CO-ox sample results are not reported until the error is cleared.

Message	Probable Cause and Corrective Action
Door Error	The system detects that the door is not closed. Close the door firmly. Ensure that the door is closed whenever you power up the system. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. If the door does not close: 1. Test the door using the **Door** button in Diagnostic tests. 2. Check cable connections. 3. Replace the door lock assembly.
Excessive Bubbles in COox Sample.	The system cannot analyze the patient or QC sample for CO-ox results because it detects bubbles in the sample chamber. This can occur if the sample contained bubbles when you introduced it into the sample port or if an obstruction is present. This message appears in the events log. Introducing the jagged end of capillary tubes into the sample port can also cause this problem. The sharp edges of capillary tubes can damage the sample port, affecting sample aspiration. 1. To avoid bubbles in patient samples, ensure that you use the recommended collection, storage, handling, and mixing techniques as described in *Collecting Patient Samples* in Section 1 in the *Rapidpoint 400 Series Operator's Manual.* For QC samples, ensure that you use the storage and handling techniques recommended by the manufacturer. 2. Analyze the sample again, ensuring that the sample has no bubbles before introducing it into the sample port. Checking for bubbles is especially important for samples introduced from capillary tubes. 3. Analyze a new patient sample ensuring that the sample has no bubbles before introducing it into the sample port. If you are analyzing a capillary sample, ensure that you introduce the fire-polished (smooth) end of the capillary tube into the sample port. 4. When introducing the sample, introduce the sample device into the sample port as shown on the screen.

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Message	Probable Cause and Corrective Action
Incorrect M Cartridge	The system detects that the measurement cartridge just installed is not compatible with the system. This can happen because the wrong cartridge was installed on the system; a Rapidpoint 400 cartridge was installed on a Rapidpoint 405 system, or a Rapidpoint 405 cartridge was installed on a Rapidpoint 400 system. The other possibility is that the system has an older version of software that cannot accept the cartridge. 1. If the wrong cartridge was installed, replace the cartridge with the correct type. Install a Rapidpoint 400 cartridge only on a Rapidpoint 400 system and a Rapidpoint 405 cartridge on a Rapidpoint 405 system. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 to install a new cartridge. 2. If the cartridge does not match the software, use a different cartridge, or install the correct version of software. Then replace the measurement cartridge with a new one.
Installation error. Unable to complete the installation. Try again.	The installation of the new system software from the network has failed. 1. Ensure that the correct name or IP address was entered in Setup for the system that contains the new software. 2. Ensure that the new software is available on the source system. 3. Ensure that the Rapidlink system or the source system is configured to communicate with the Rapidpoint 400 series system. 4. Ensure that the Rapidpoint 400 series system is configured to communicate with the Rapidlink system or the source system. 5. Check that all cables are connected correctly. 6. Start the software installation again.

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Message	Probable Cause and Corrective Action
Insufficient Sample Volume. The system cannot complete analysis. Touch Continue to begin the sequence to clear the system. Replace the sample port when prompted.	The system cannot report results for the patient or QC sample because it does not have enough sample to complete analysis. This can occur if the sample device does not contain enough sample, or if an obstruction prevents the system from aspirating enough sample for analysis. The Insufficient Sample message appears in the events log. 1. Touch **Continue** to remove the message, then replace the sample port when prompted. Refer to *Replacing the Sample Port* in *Replacing Components.* 2. If prompted, replace the cartridges as described in *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.* 3. Ensure that the sample device you use contains sufficient sample. Refer to *Collecting Patient Samples* in Section 1 in the *Rapidpoint 400 Series Operator's Manual* to identify the minimum sample volume for the sample device that you are using. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. If cartridge replacement does not solve the problem, view the events log for errors that may be causing the problem. Continue with the associated service solutions.
M Cartridge Expired	The measurement cartridge has exceeded its shelf life or its operating life or is depleted. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual* to replace both cartridges.
M Cartridge Not Valid	The system detects that an expired measurement cartridge was installed, that a used measurement cartridge was reinstalled, or that a measurement cartridge was installed without using the prompted method that you begin from the Status screen. The system is unable to use the cartridge. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual* to replace both cartridges.

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Message	Probable Cause and Corrective Action
No AQC Cartridge	The system detects that an AutomaticQC cartridge is not installed. Refer to *Replacing the AutomaticQC Cartridge* on page 168 to install the cartridge. If the AutomaticQC cartridge was just installed, the cartridge may not be installed correctly, or the system may have a problem. Call for technical assistance. **NOTE:** If you need to continue to analyze patient samples, remove the AutomaticQC cartridge and turn off the AutomaticQC option in Setup. Refer to corrective actions in *Replacing the AutomaticQC Cartridge* on page 168. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. If cartridge replacement does not solve the problem: 1. Examine the pins on the latch assembly to determine if they are missing or bent. 2. Check cables and connections. 3. Replace the latch assembly. 4. Replace the AQC frame assembly.
No M Cartridge	The system detects that a measurement cartridge is not installed. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual* to install both cartridges. If the measurement cartridge was just installed, the cartridge may not be installed correctly, or the system may have a problem. Call for technical assistance.

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Message	Probable Cause and Corrective Action
	Service Solutions Perform service solutions only after all other corrective actions have been completed. If cartridge replacement does not solve the problem: CAUTION: Before removing the measurement cartridge, ensure that any tests not requiring removal of the measurement cartridge are performed. Once a measurement cartridge is removed, if reinstalled it is likely to fail within a few days. To verify repairs, you may reinstall the measurement cartridge while remaining in Diagnostics. A new cartridge *must* be installed before leaving the customer site. 1. Use the measurement cartridge simulator to perform the measurement test. 2. Check cables and connections to cartridge interface assembly. 3. Replace the connector block. 4. Replace the cartridge interface module
No Paper in Printer	The printer is out of paper. 1. Install a new roll of paper as described in *Replacing the Printer Paper* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.* 2. If necessary, access the Recall menu to locate and print sample results or calibration data that were not printed while the printer was out of paper. **Service Solutions** Perform service solutions only after all other corrective actions have taken place. 1. Perform the printer test. 2. Replace the display printer assembly. 3. Replace the UIP board.

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Message	Probable Cause and Corrective Action
No W Cartridge	The system detects that a wash/waste cartridge is not installed. Refer to *Replacing the Wash/Waste Cartridge* in Section 3 in the *Rapidpoint 400 Series Operator's Manual* to install a new cartridge. **Service Solutions** Perform service solutions only after all other corrective actions have taken place. 1. Look at the wash/waste contact lever for the switch to see if it is bent. 2. Look at the switch for loose screws or corrosion. 3. Replace the wash/waste switch.
Out of Reporting Range	The parameter shown in the message is above or below the valid measurement range. The appropriate symbol, -----↑ or -----↓, appears next to the parameter name on the results screen and on the report. Refer to *Symbols on Screens and Reports* on page 162, to identify the causes and corrective actions for out-of-range results.
QC Lot Not Defined	Controls are currently scheduled for Required QC analysis, but no lot information is entered for a control that is currently scheduled. Define a new lot of the control as described in *Defining New Lots of Controls for Required QC* in Section 6 in the *Rapidpoint 400 Series Operator's Manual* and then analyze the scheduled controls.
QC Material Expired	Controls are currently scheduled for Required QC analysis, but the lot is expired for a control that is currently scheduled. Define a new lot of the control as described in *Defining New Lots of Controls for Required QC* in Section 6 in the *Rapidpoint 400 Series Operator's Manual* and then analyze the scheduled controls.
Question Result:	The system detected an atypical response when measuring the parameter identified in the message. The system does not report results for the affected parameter. When this message appears with the hematocrit (Hct) result, it may indicate that the Hct result was not reported because sodium (Na^+) failed Required QC or AutomaticQC analysis or Required QC was not performed. Analyze the sample again to verify the result.

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Message	Probable Cause and Corrective Action
	Service Solutions Perform service solutions only after all other corrective actions have taken place. If Question Results (?) are chronic, perform the following steps: **NOTE:** Poor mixing can cause an Hct Question Result error. 1. Replace the measurement cartridge. 2. Use the cartridge simulator to perform the measurement test. Refer to *Using the Measurement Cartridge Simulator* on page 240 for information about the cartridge simulator. 3. Replace the connector block. 4. Replace the interface module.
Required QC Due	Appears when the next required QC is scheduled to be analyzed. The time period during which QC must be analyzed appears with the message. Touch the QC button to start the scheduled QC analysis. The message disappears after the required QC is finished.
Sensors Unavailable For QC	Controls are currently scheduled for Required QC or AutomaticQC analysis, but all parameters scheduled for the next level of QC analysis are not available (for example, because they are out of calibration). Determine why parameters are not available and correct the problem. Refer to *Button and Parameter Status* on page 155 for more information.
SulfHb > 1.5%	The system detects that Sulfa hemaglobin was detected in the sample with an estimated concentration greater than 1.5%.
System Error. Please wait. The system is trying to recover from the error.	The system detects that a condition exists that prevents routine operation. The system is attempting to correct the problem. You can touch **Continue** to remove the message. However, the system remains at the Status screen and displays the message again every 5 minutes while it tries to correct the problem. If the system is unable to correct the problem, a message appears prompting you to call for service. 1. Operate the system in an environment with ambient temperature within 15 to 32°C. 2. If prompted to call for service, record the message and call for technical assistance. **Service Solutions** View the events log for errors that may be causing the problem and refer to the appropriate section of this manual.

(Continued)

Message	Probable Cause and Corrective Action
System Error. Turn the power switch off. Wait 10 seconds then turn the switch on.	An electronic or processing error has occurred. 1. Shut down the system as described in *Shutting Down the System* on page 256, wait 10 seconds, and then turn the system on. 2. If the message appears again, record the message and call for technical assistance. **Service Solutions** View the events log for errors that may be causing the problem and refer to the appropriate section of this manual.
System requires operator attention.	The message appears on the Sign-In screen if any of the following conditions occurs: • Required QC analysis is currently scheduled • The cartridges are nearly expired or depleted. • One or more parameters are turned off because they failed Required QC or AutomaticQC analysis, Required QC analysis was not performed when scheduled, or parameters failed calibration. 1. Enter your password and touch the **Continue** button. 2. View the Analysis screen to determine what action is required and then take the appropriate action. Refer to *Button and Parameter Status*, Section 5 in the *Rapidpoint 400 Series Operator's Manual*, if you need more information about the status of buttons at the Analysis screen. Refer to Section 5, *Understanding the Rapidpoint 400 Series System* in the *Rapidpoint 400 Series Operator's Manual*, if you need more information about the Analysis screen and the symbols that appear at this screen and on the banner.

(Continued)

Message	Probable Cause and Corrective Action
Temp Not Ready	The system detects that the temperature of the sensor module is outside the acceptable measurement range. This message can occur when a new measurement cartridge is warming up, when the system is warming up after being shut down, and when the door remains open for too long. 1. Wait until the system removes the message from the Status screen before analyzing samples. 2. If the message appears again, record the message and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have taken place Ensure that the instrument and measurement cartridge have reached normal operating temperature, then: 1. Check that the system location is not causing the ambient temperature to be too high or too low. 2. View the events log for errors that may be causing the problem. 3. If the message occurs frequently: a. Replace the connector block. b. Replace the cartridge interface assembly.

Temp Not Ready Descriptions

During Cartridge Init

The Temp Not Ready during cartridge init will be set if the temperature is outside the range of 37.0 ± 1.0°C.

The first calibration (full cal) will be run even if the Temp Not Ready condition exists.

As soon as the temperature gets within the range 37 ± 1.0°C the Temp Not Ready exception changes to the Temp Warning exception.

The measurement module temperature is outside the range 37 ± 0.5°C. This exception does not indicate failure of the temperature control system. Rather, it alerts the user that the instrument is in the process of warming up and that no sample analysis requests will be accepted until normal operating temperature is reached. This exception is generated if the temperature control software was down for a few minutes or more.

In Retro Calibration Mode

As soon as the temperature gets within the range 37 ± 0.4°C the Temp Not Ready exception disappears and sample introduction is again allowed.

Not in Retro Calibration Mode

As soon as the temperature gets within the range 37 ± 0.5°C, but outside the range 37 ± 0.20°C, the Temp Not Ready exception changes to the Temp Warning exception, and sample introduction is again allowed. As soon as the temperature falls within 37 ± 0.20°C, the warning message disappears.

All Modes

Refer to the related exceptions: Temp Warning and Temp Out of Range.

If during a non-fatal temperature error no measurement cartridge is installed then the measurement cartridge replacement procedure will preempt the temperature handling.

Message	Probable Cause and Corrective Action
Temp Out of Range	The system detects that the temperature of the sample is beyond the acceptable measurement range at the end of sample analysis. This message usually appears if you analyze a sample before the measurement cartridge reaches its normal operating temperature. The system does not report the sample results. Analyze the sample again. If the message appears again, record the message and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have taken place Ensure that the instrument and measurement cartridge have reached normal operating temperature, then: 1. Check that the system location is not causing the ambient temperature to be too high or too low. 2. View the events log for errors that may be causing the problem. 3. If the message occurs frequently: a. Replace the connector block. b. Replace the cartridge interface assembly.

Temp Out of Range Descriptions

Temp Out of Range is detected at the end of the sample measurements.

In Retro Calibration Mode

At the end of measurement, the measurement module temperature was found to be outside the range 37 ± 0.4°C for all sample types.

Not in Retro Calibration Mode

At the end of measurement, the measurement module temperature was found to be outside the range 37 ± 0.2°C for all patient sample types. For QC sample types, the range will be 37 ± 0.4°C. This exception is likely caused by fluid introduction before the instrument had reached the normal operating temperature.

All Modes

This exception causes the sample results to be aborted.

Refer to the related exceptions: Temp Not Ready and Temp Warning.

Message	Probable Cause and Corrective Action
Temp Warning	The system detects that the temperature of the sensor module is outside the range of 37°C ± 0.20°. This message can occur when a new measurement cartridge is warming up, when the system is warming up after being shut down, and when the door remains open for too long. If necessary, you can analyze samples while this message is displayed. 1. If possible, wait until the system removes the message from the Status screen, indicating the temperature is now within range, before analyzing samples. 2. If the message appears again, record the message and call for technical assistance. **Service Solutions** Perform service solutions only after all other corrective actions have taken place Ensure that the instrument and measurement cartridge have reached normal operating temperature, then: 1. Check that the system location is not causing the ambient temperature to be too high or too low. 2. View the events log for errors that may be causing the problem. 3. If the message occurs frequently: a. Replace the connector block. b. Replace the cartridge interface assembly.

Temp Warning Descriptions

In Retro Calibration Mode

If the measurement module temperature is outside the range 37 ± 0.4°C Temp warning exception is set.

As soon as the temperature gets within the range 37 ± 0.40°C, the temp warning message disappears.

Not in Retro Calibration Mode

If the measurement module temperature is outside the range 37 ± 0.20°C the temp warning exception is set. This exception does not indicate failure of the temperature control system. Rather, it alerts the user that the instrument is in the process of warming up and is close to the normal operating temperature. Sample analysis requests will be accepted. This exception is generated if the temperature control software was down for a few minutes or more.

As soon as the temperature gets within the range 37 ± 0.20°C, the Temp Warning message disappears.

All Modes

Starting sample operations while this exception is posted may generate the Temp Out of Range exception.

Refer to the related exceptions: Temp Not Ready and Temp Out of Range.

If during a non-fatal temperature error no measurement cartridge is installed then the measurement cartridge replacement procedure will preempt the temperature handling.

Message	Probable Cause and Corrective Action
The language cannot be selected because the current version is not installed. Install the latest language version to select the language.	The current version for the language selected in Setup is not installed on the system. 1. Obtain the software that contains the latest version of the language that you want to select. It should be the same version as the English language installed on the system. 2. Install the latest version for the language that you need. Refer to *Installing New System Software* in Section 7 in the *Rapidpoint 400 Series Operator's Manual* 3. Select the language again in Setup.

(Continued)

Message	Probable Cause and Corrective Action
The system detected an obstruction and cannot complete analysis. Touch **Continue** to begin the sequence to clear the obstruction. Replace the sample port when prompted.	The system cannot analyze the current patient or QC sample because it detects an obstruction in the sample. This obstruction can occur if the sample contained fibrin clots. This event causes a D39 Obstruction message to appear in the events log. 1. Touch **Continue** to remove the message, then replace the sample port when prompted. Refer to *Replacing the Sample Port* in *Replacing Components.* 2. If prompted, replace the cartridges as described in *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.* 3. To avoid clots in patient samples, ensure that you use the recommended collection, storage, handling, and mixing techniques as described in *Collecting Patient Samples* in Section 1 in the *Rapidpoint 400 Series Operator's Manual.* For QC samples, ensure that you use the storage and handling techniques recommended by the manufacturer.
The system did not detect a sample. Remove the sample device if present and touch **Continue.** Replace the sample port when prompted	The system cannot report results for the patient or QC sample because it did not detect the sample moving through the system. This can occur if the sample device was not inserted in the sample port, if an obstruction blocked sample flow, or if a label on the syringe caused the syringe to fall off. This event causes a D39 Obstruction message to appear in the events log. 1. Replace the sample port when prompted. Refer to *Replacing the Sample Port* in *Replacing Components.* 2. If prompted, replace the cartridges as described in *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.* 3. To avoid clots in patient samples, ensure that you use the recommended collection, storage, handling, and mixing techniques as described in *Collecting Patient Samples* in Section 1 in the *Rapidpoint 400 Series Operator's Manual.* 4. Ensure that labels attached to the syringe will not block the syringe from entering the system and cause it to fall off. Position the label toward the back of the syringe barrel near the plunger if required.

(Continued)

Message	Probable Cause and Corrective Action
This password is about to expire. Renew the password before access to the system is denied.	This message may appear on systems connected to the Rapidlink system. The message indicates that 14 days remain before you exceed your certification date and will be prevented from accessing the system. Contact your system supervisor to renew your password.
This password is expired. Renew the password to access the system.	This message may appear on systems connected to the Rapidlink system. The message indicates that you have exceeded your certification date and cannot access the system. Contact your system supervisor to renew your password.
Uncorrected:	The system did not correct the hematocrit (Hct) result for either sodium (Na^+) or potassium (K^+) because the sodium or potassium result is beyond the reporting range or because the sodium or potassium sensor is out of calibration. The system uses a default value of 140 mmol/L for sodium or a value of 4 mmol/L for potassium to correct the Hct result. On the screen and the report, the letter u appears next to the result. If the sodium or potassium result is beyond the reporting range, analyze the sample again, if possible, or analyze a QC sample, to verify the result. If sodium or potassium is out of calibration, subsequent calibrations may make the sensor available again. If sodium or potassium remains out of calibration, replace the cartridges as described in *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.*
Unrecoverable System Error. Call your service representative for assistance.	The system detects a problem that it cannot correct. Call for technical assistance. **Service Solutions** View the events log for errors that may have caused the problem and refer to the appropriate section of this manual.

(Continued)

Message	Probable Cause and Corrective Action
Unsuccessful Connection. Review the setup values. Ensure that the cables are connected and that the network is operating.	When you touched the **Continue** button at the LIS Setup screen, the system attempted to connect to the Rapidlink data management system or the LIS, but the connection was not successful. 1. Touch the **Continue** button to display the LIS Setup screen. 2. Verify that you entered the correct communication settings and then touch the **Continue** button. Refer to Appendix E in the *Rapidpoint 400 Series Operator's Manual* for more information about the communication settings. 3. If the connection fails again, ensure that the Rapidlink system or the LIS is able to accept messages from the Rapidpoint 400 series system. 4. Ensure that the Rapidlink data management system or the LIS is correctly configured to communicate with the Rapidpoint 400 series system. 5. Ensure that the cable is not damaged and that it is the correct cable for connecting the systems. 6. If necessary, touch **None** at the Communications screen to turn off the connection until you can resolve the problem. **Service Solutions** Perform service solutions only after all other corrective actions have been completed. 1. Ensure the communications setup information is correct. 2. Look at the LED at the network connector on the UIP board to ensure the lights are on. 3. Check cables and connectors. 4. Replace the rear interconnect cable. 5. Replace the UIP board.
W Cartridge Expired	The wash/waste cartridge has exceeded its operating life or is depleted. Refer to *Replacing the Wash/Waste Cartridge* in Section 3 in the *Rapidpoint 400 Series Operator's Manual* to replace the wash/waste cartridge.

Diagnostics

This Section describes how to print diagnostic reports, how to copy diagnostic data to a diskette, and how to use the diagnostic tests to evaluate the function of certain components of the Rapidpoint 400 series systems. You can print diagnostic reports that provide information about the performance of the measurement channels, the sensors, the printer, and the temperature control system. You can also perform diagnostic tests that evaluate the performance of the valve and the sample and wash pumps.

Only Bayer HealthCare service representatives can access the diagnostic tests. Step-by-step procedures guide you through each test.

⚠ **CAUTION:** Before removing the measurement cartridge, ensure that any tests not requiring removal of the measurement cartridge are performed. Once a measurement cartridge is removed, if reinstalled it is likely to fail within a few days. To verify repairs, you may reinstall the measurement cartridge while remaining in Diagnostics. A new cartridge *must* be installed before leaving the customer site.

The following table briefly describes the function of each test:

Test	Function
M valve	moves the valve for the measurement cartridge to prescribed positions while you look for any impediments and listen for unusual noises
AQC valve	moves the valve for the AutomaticQC cartridge to prescribed positions. Listen for noises and check that positions are correct.
sample pump	moves the sample pump at various speeds while you look and listen for any obstructions or impediments to pump movement
wash pump	moves the wash pump at various speeds while you look and listen for any obstructions or impediments to pump movement
measurement	prints a report containing the measurement data for each channel
sensors	prints a report with the raw data from the most recent 2-point or full calibration
printer	prints all printable characters

(Continued)

Test	Function
temperature	prints the temperature for various system components
lamp cal	tests and calibrates the halogen lamp
wavelength cal	tests neon lamp operation and alignment
lamp on/off	verifies proper operation of halogen lamp
sample chamber	moves the CO-ox sample chamber

Printing Diagnostic Reports

Use this procedure to print the following diagnostic reports:

- measurement
- sensors
- printer
- temperature

  NOTE: Some tests are will not be available on the Diagnostics screen if the printer is out of paper.

1. Touch the **Recall** button.
2. Touch **Sample Totals**.

⚠ **CAUTION:** The system cannot perform routine fluidic activities while you are at the Diagnostics screen or while you are performing diagnostic tests. When you exit from the Diagnostics screen, the system may perform an extended calibration before you can use the system.

3. Touch **Diagnostics.**
4. Enter the service password, or use the password of the day.

   The Diagnostics screen appears.

5. Print the necessary report:

If you want to print the . . .	Then touch . . .	Using the following cartridge . . .
measurement report	**Measurement**	simulator
sensor report	**Sensor**	real
printer report	**Printer**	real or simulator
temperature report	**Temperature**	real

The system prints the report.

Sample Measurement Report

```
MEASUREMENT
System ID 0401-02318
03/09/2001 16:43

   H M L
 1 0 0 0 0.0138
 2 F F F 403.2592
 3 F 0 F 214.3178
 4 F F 0 21.2354
 5 F F 0 20.619
 6 - - - 21.3689
 7 - - - 21.1249
 8 F 0 F -106.2057
 9 F 0 F 43.852
10 F 0 F 443.726
11 F F F 109.3155
12 F 0 F 594.8173
13 0 0 0 39.2903
14 - - - -1497.7827
15 F 0 F 205.7034
16 - - - 6.3907
17 - - - 7.92
18 F F 0 178.8849
19 F F 0 135.9858
20 - - - 37.7526
21 - - - 37.8881
22 - - - 37.0095
```

Refer to the table on page 241 for measurement channel signal names and ranges.

Sample Sensor Report

```
SENSORS
System ID 0401-02318
03/09/2001 16:43

 1    34.5675     34.5675
 2   -66.6366    -66.6366
 3     4.6892      4.6892
 4     4.9512      4.9512
 5   -20.7470    -20.7470
 6    22.3860     22.3860
 7    89.1464     89.1464
 8   -14.9300    -14.9300
 9   202.6121    202.6121
10     0.0000      0.0000
```

Sample Temperature Report

```
TEMPERATURE
System ID 0401-02318
03/09/2001 16:44

1 1639
2 MAIN
3 48
4 649
5 37.896
6 208
7 37.752
8 37.005
```

Refer to the table on page 235 for definitions for a printed temperature report.

Testing the Printer

Use this procedure to check that the printer character set is functioning correctly.

1. Touch the **Recall** button.
2. Touch **Sample Totals.**

⚠ **CAUTION:** The system cannot perform routine fluidic activities while you are at the Diagnostics screen or while you are performing diagnostic tests. When you exit from the Diagnostics screen, the system may perform an extended calibration before you can use the system.

3. Touch **Diagnostics**.

4. Enter the service password, or use the password of the day.

   The Diagnostics screen appears.

NOTE: Ensure that printer paper is inserted into the printer.

5. Touch **Printer**.

   The paper advances and the printer begins to print.

6. Discard the printout, then touch **Printer** again.

7. Verify the printer output against the following printer character set.

Sample Printer Report (Character Set)

```
PRINTER
System ID 0401-02318
03/09/2001 16:43

!"#B%&'()*+,-./012345678
9:;<=>?@ABCDEFGHIJKLMNOP
QRSTUVWXYZ[\]^_`abcdefgh
ijklmnopqrstuvwxyz'|¯~ Ç
üéâäàåçêëèïîìÄÅÉæÆôöòûùÿ
öÜ□°V≤≥áíóúñÑâ°¿®FI"¡«»Ď
∇áᅲᅭÁÂÀ®=¤▲▼          ãÃ
 ™      "-•ÊËÈ ÍÎÏ     pl ó

!ćłńóśź()żź,ż./012345678
9:;ąęĘ?ĄABCDEFGHIJKLMNOP
QRSTUVWXYZ[\]^_śabcdefgh
ijklmnopqrstuvwxyzĆŁŃÓĄA
БВГДЕЖЗИЙКЛМНОПРСТУФХЦЧШ
ЩЪЫЬЭЮЯ ｡｢｣､･ｦｧｨｩｪｫｬｭｮｯｰ
ｱｲｳｴｵｶｷｸｹｺｻｼｽｾｿﾀﾁﾂﾃﾄﾅﾆﾇﾈ
ﾉﾊﾋﾌﾍﾎﾏﾐﾑﾒﾓﾔﾕﾖﾗﾘﾙﾚﾛﾜﾝﾞﾟa
```

Definitions for a Printed Temperature Report

Row	Data	Description
1	Control Time	Time in seconds that the heater control has been turned on. If no heater problems are seen, then this is the time since power on.
2	Current State	Normally MAIN, or SEQ if the sequence is running or has run in the last 60 seconds.
3	Steady State Count	Time in seconds that the heater has been at the steady state. Uses this signal for error checking and block set point changes.
4	Block DAC	Indicator of how much power is being provided to the block heater. (0 is OFF, 2047 is Maximum ON).
5	Block Temperature	Temperature of the block heater in degrees Celsius (°C).
6	Preheater DAC	Indicator of how much power is being provided to the preheater. (0 is OFF, 2047 is Maximum ON).
7	Preheater temperature	Temperature of the preheater in degrees Celsius (°C). This value tends to follow the block temperature.
8	Sample Path temperature	Temperature of the sample path in degrees Celsius (°C). This temperature should be close to 37.00 ± 0.15 for a stable system reading. Most error and warning flags set are based on this value.
9	Cover Temperature	Future addition.

8. Touch the **Continue** button three times to return to the Analysis screen.

Testing the Measurement Valve in Diagnostics

Use this procedure to test the components that operate the valve located inside the measurement cartridge with the system Diagnostics.

While performing the test, the system checks and verifies the correct valve positions.

1. Touch the **Recall** button.

2. Touch **Sample Totals.**

⚠ **CAUTION:** The system cannot perform routine fluidic activities while you are at the Diagnostics screen or while you are performing diagnostic tests. When you exit from the Diagnostics screen, the system may perform an extended calibration before you can use the system.

3. Touch **Diagnostics.**
4. Enter the service password, or use the password of the day.

   The Diagnostics screen appears.

5. Touch **M Valve.**

   The second Diagnostic screen appears.

6. Touch the **Start, Change,** and **Stop** buttons sequentially to run the test

   The system moves the valve.

7. Look for obstructions and listen for any unusual noises that may indicate a problem with the valve.

NOTE: If the photosensor detects an obstruction the a D33: 1 error is posted.

8. Touch **Change** to move the valve to the next position and then look and listen for problems.

   The valve test moves the valve to three positions numbered 1 through 3. The number of the current position appears on the screen when you touch **Change**. The test is complete when position 3 appears on the screen.

9. Touch **Stop** to stop the test.

   Wait while the system returns the valve to the correct position.

10. Touch the **Continue** button three times to return to the Analysis screen.

NOTE: If the diagnostic test indicates a problem(s) with valve operation, proceed with Using the Measurement Cartridge Simulator on page 240.

Testing the AutomaticQC Cartridge Valve in Diagnostics

Use this procedure to test the components that operate the valve located inside the AutomaticQC cartridge.

CAUTION: The system ejects the cartridge and the cartridge is no longer valid when performing this test.

1. Touch the **Recall** button.
2. Touch **Sample Totals.**

CAUTION: The system cannot perform routine fluidic activities while you are at the Diagnostics screen or while you are performing diagnostic tests. When you exit from the Diagnostics screen, the system may perform an extended calibration before you can use the system.

3. Touch **Diagnostics.**
4. Enter the service password, or use the password of the day.

   The Diagnostics screen appears.
5. Touch **AQC Valve.**

   The second Diagnostic screen appears.
6. Touch the **Start, Change**, and **Stop** buttons sequentially to run the test

   The system moves the valve.
7. Listen for any unusual noises that may indicate a problem with the valve.
8. Touch **Change** to move the valve to the next position and then listen for problems.

   The valve test moves the valve to all 14 positions. The number of the current position appears on the screen when you touch **Change**. The test is complete when position 14 appears on the screen.
9. Touch **Stop** to stop the test, the system ejects the cartridge.

   Wait while the system returns the valve to the correct position.
10. Touch **Continue** button three times to return to the Analysis screen.

NOTE: If the diagnostic test indicates a problem(s) with valve operation, proceed with *Using the AutomaticQC Cartridge Simulator* on page 246.

Testing the Pumps

Use this procedure to test the sample pump and the wash pump, which are located on the system behind the measurement cartridge.

BIOHAZARD: Refer to *Protecting Yourself from Biohazards*, for recommended precautions when working with biohazardous materials.

1. Touch the **Recall** button.
2. Touch **Sample Totals**.

CAUTION: The system cannot perform routine fluidic activities while you are at the Diagnostics screen or while you are performing diagnostic tests. When you exit from the Diagnostics screen, the system may perform an extended calibration before you can use the system.

3. Touch **Diagnostics**.
4. Enter the service password, or use the password of the day.

   The Diagnostics screen appears.

CAUTION: Before performing this test, remove the measurement and wash/waste cartridges in order to observe the pumps during testing.

CAUTION: Ensure that you perform all necessary tests not requiring removal of the measurement cartridge. Once a measurement cartridge is removed, the measurement cartridge is likely to fail within a few days after replacement. Removing the measurement cartridge disconnects the oxygen sensor from the battery backup circuit and causes a latent failure.

5. Remove the measurement and the wash/waste cartridges:
   a. Open the door.
   b. Lift the latch.
   c. Remove the measurement cartridge.
6. Leave the system door open so that you can view the pumps.

7. Test the pumps:

If you want to test the . . .	Then touch . . .
sample pump, which is located on the right as you face the system	**Sample Pump**. The pump turns toward you.
wash pump, which is located on the left as you face the system	**Wash Pump**. The pump turns away from you.

The second Diagnostic screen appears.

8. Touch the **Start, Change**, and **Stop** buttons sequentially to run the test

   The pump begins to move.

9. Look for obstructions and listen for any unusual noises that may indicate a problem with the pump.

10. Touch **Change** to advance the pump to the next speed.

    The pump test moves the pump at four speeds numbered 1 through 4. The number of the current speed appears on the screen when you touch **Change**. The test is complete when speed 4 appears on the screen.

11. Touch **Stop** to stop the test.

12. Repeat this procedure from step 6 if you want to test the other pump.

If the test . . .	Then . . .
passes	Reinstall the measurement cartridge and the wash/waste cartridge. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.*
fails	Replace the: 1. Pump roller cages. 2. Motor. 3. Main board. 4. UIP board.

13. Touch the **Continue** button three times to return to the Analysis screen.

Using the Measurement Cartridge Simulator

BIOHAZARD: Refer to *Protecting Yourself from Biohazards* for recommended precautions when working with biohazardous materials.

Use the measurement cartridge simulator along with the diagnostics software to check:

- measurement channels
- pump flow rate

The cartridge simulator is powered by the system and requires no maintenance.

Tools Required

- measurement cartridge simulator

Testing the Measurement Channels

The cartridge simulator tests the following measurement channels:

- fluid detector and hematocrit
- amperometric (oxygen/glucose)
- potentiometric

1. Touch the **Recall** button.
2. Touch **Sample Totals.**
3. Touch **Diagnostics.**
4. Enter the service password, or use the password of the day.
5. Touch the **Continue** button.

CAUTION: Before removing the measurement cartridge, ensure that any tests not requiring removal of the measurement cartridge are performed. Once a measurement cartridge is removed, if reinstalled, it is likely to fail within a few days. To verify repairs, you may reinstall the measurement cartridge while remaining in Diagnostics. A new cartridge *must* be installed before leaving the customer site.

6. Remove the measurement and the wash/waste cartridges:

   a. Open the door.

b. Lift the latch.

c. Remove the measurement cartridge.

7. Install the cartridge simulator.

8. Rotate the range switch on the front of the cartridge simulator, to select the range (low, nominal, or high) for the test. Refer to the following table:

Measurement Channel	**Name**	**Low Range**	**Nominal Range**	**High Range**
1	GND	-0.25 to +0.25	-0.25 to +0.25	-0.25 to +0.25
2	PO2	-25 to +25	+790 to +970	+2900 to +3600
3	PH	-1382 to -968	-119 to +347	+1145 to +1662
4	GLU_A	-50 to +50	-340 to -460	-3000 to -3700
5	GLU_B	-50 to +50	-340 to -460	-3000 to -3700
6	LAC_A	N/A	N/A	N/A
7	LAC_B	N/A	N/A	N/A
8	K	-1229 to -809	-246 to +214	+732 to +1232
9	Na	-787 to -349	+39 to +511	+870 to +1376
10	Cl	-79 to +388	+422 to +910	+924 to +1432
11	Ca	-645 to -200	+132 to +608	+904 to +1411
12	HCO3	-173 to +291	+594 to +1089	+1051 to +1882
13	REF	-200 to +200	-200 to +200	-200 to +200
14	DAC	N/A	N/A	N/A
15	PH2	-1382 to -968	-119 to +347	+1145 to +1662
16	CRE_A	N/A	N/A	N/A
17	CRE_B	N/A	N/A	N/A
18	FD1/HCT1	-350 to +650	+750 to +1818	+1850 to +3148
19	FD2/HCT2	-350 to +650	+750 to +1818	+1850 to +3148
20	N/A	N/A	N/A	N/A
21	N/A	N/A	N/A	N/A
22	N/A	N/A	N/A	N/A

9. At the Diagnostics screen, touch **Measurement.**

   The results for each channel are printed on the report.

   F = fail

   O = pass

10. Repeat steps 8 and 9 for each range you want to check.

11. Compare the results on the printed report to the ranges in the Measurement Channels Table.

If the results . . .	**Then . . .**
are out of range	a. Remove and reinstall the cartridge simulator and test the measurement channels again. b. If the test fails again, replace the connector block. For more information, refer to *Illustrated Parts Lists.*
are within the ranges provided in the measurement channels table	remove the cartridge simulator and install a new measurement cartridge. **NOTE:** If you will be continuing to verify system performance, then reinstall the original cartridge.

Testing the Pump Flow

Use the cartridge simulator to check the pump flow for the sample and the wash pumps of the Rapidpoint 400 series system.

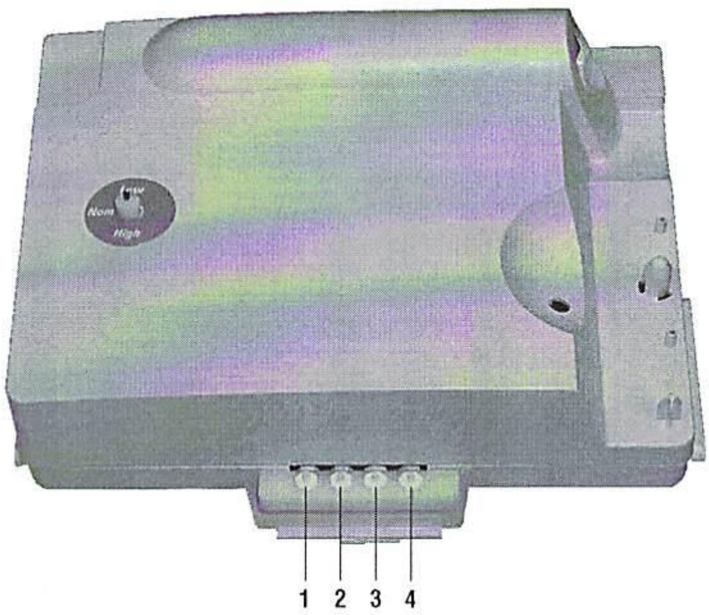
Tools Required

- two beakers
- 4 pieces of Tygon tubing,

  0.159 cm x 0.318 cm x 0.305M (1/16 ID x 1/8 OD x 1 foot long)

⚠ **CAUTION:** Before removing the measurement cartridge, ensure that any tests not requiring removal of the measurement cartridge are performed. Once a measurement cartridge is removed, if reinstalled it is likely to fail within a few days. To verify repairs, you may reinstall the measurement cartridge while remaining in Diagnostics. A new cartridge *must* be installed before leaving the customer site.

1. Remove the measurement and the wash/waste cartridges. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual*.
2. Connect the Tygon tubing to the cartridge simulator.



1 Wash In
2 Wash Out
3 Sample Out
4 Sample In

---

3. Install the cartridge simulator.

NOTE: Perform steps 4 through 14 to test the pump flow for either the sample or the wash pump.

4. Place the inlet tubes into a beaker of reagent water.
5. Place the outlet tubes into an empty beaker.

   If you are already in Diagnostics, go to step 11.

6. Touch the **Recall** button.
7. Touch **Sample Totals**.
8. Touch **Diagnostics**.
9. Enter the service password, or use the password of the day.
10. Touch the **Continue** button.

11. Select either **Sample Pump** or **Wash Pump.**
12. Touch **Start**.
13. Touch **Change** to advance the pump speed. Stop touching **Change** when the pump reaches the highest of the four speeds.
14. Observe the flow of water from the tube into the empty beaker. The flow should be smooth and even.

If...	Then...
the flow is uneven	a. Replace the cartridge interface module, valve/frame assembly, roller cages, or pump motor(s). For more information, refer to *Replacing Components*. b. Repeat steps 3 through 14.
the results are acceptable	remove the cartridge simulator and install a new measurement cartridge. **NOTE:** If you will be continuing to verify system performance, then reinstall the original cartridge

Remove the tubes from the beaker of water and allow the pump to drain before testing the other pump.

Testing the Measurement Cartridge Valve Alignment

Use the valve alignment gauge to check the valve alignment for the Rapidpoint 400 series system. The dial indicator on the front of the valve alignment gauge shows the results of the valve position 2 measurement in the system Diagnostic Tests.

Tools Required

- Verification Gauge

NOTE: Prior to use, check that the valve alignment gauge is correctly set to zero. If adjustment is required, adjust using the valve alignment plate.

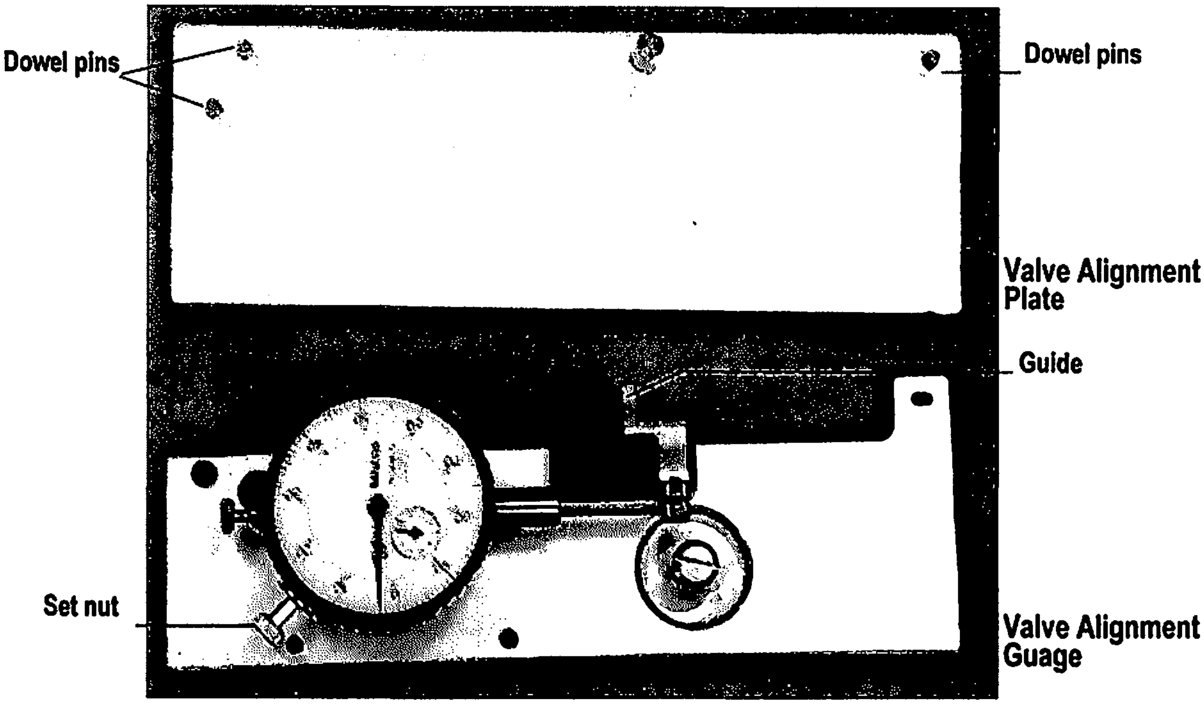
If adjustment is...	Then...
required	follow the procedure as described in step 1.
not required	go to step 2.

1. Set the valve alignment gauge to zero:

a. While facing the valve alignment gauge, slide the guide at the end of the gauge to the left.

b. Align the dowel pins on the valve alignment plate with the holes on the back of the valve alignment gauge.

c. When the valve alignment plate is in place, release the guide.



NOTE: Ignore the small gauge.

d. While holding the valve alignment plate against the valve alignment gauge, pull up and verify that the gauge reads within 0 ± 0.5.

If the result . . .	Then . . .
is not within the acceptable range	loosen the set nut on the gauge and adjust the gauge to zero. When adjustment is complete, tighten the set nut. Go to step 2.
is within the acceptable range	go to step 2.

⚠ **CAUTION:** Before removing the measurement cartridge, ensure that any tests not requiring removal of the measurement cartridge are performed. Once a measurement cartridge is removed, if reinstalled it is likely to fail within a few days. To verify repairs, you may reinstall the measurement cartridge while remaining in Diagnostics. A new cartridge *must* be installed before leaving the customer site.

2. Check the measurement cartridge valve alignment:
    a. Remove the measurement and the wash/waste cartridges. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.*

        NOTE: If the system is configured to receive the thumb screw, tighten the screw to hold the valve alignment gauge in place.
    b. Install the valve alignment gauge, and hold it in position.
3. Touch the **Recall** button.
4. Touch **Sample Totals.**
5. Touch **Diagnostics**.
6. Enter the service password, or use the password of the day.
7. Touch the **Continue** button.
8. Touch **M Valve**.
9. Touch **Start.** The valve moves to position 1 on the screen.
10. Touch **Change.** The valve moves to position 2 on the screen.
11. With the valve in position 2, verify that the gauge reads within 0 ± 5.
12. Touch **Stop** when done.
13. Wait until the cartridge interface returns, then remove the valve alignment gauge.

Using the AutomaticQC Cartridge Simulator

BIOHAZARD: Refer to *Protecting Yourself from Biohazards* for recommended precautions when working with biohazardous materials.

Use the AutomaticQC cartridge simulator along with the diagnostics software to diagnose problems in valve alignment, and with the IDEE ROM and cartridge connector switch.

The cartridge simulator is powered by the Rapidpoint 400 series system and requires no maintenance.

Tools Required

- AQC Cartridge Simulator
- Small flat-blade screwdriver
- Magnifying Flashlight (torch)

Testing the Valve Alignment

1. Remove the AutomaticQC cartridge from the Rapidpoint 400 series system.

NOTE: Ensure that the AQC valve on the AutomaticQC cartridge simulator is positioned in the center of its travel.

2. Install the AutomaticQC cartridge simulator with the switch in the ON position.

   If you are already in Diagnostics, go to step 8.

3. Touch the **Recall** button.
4. Touch **Sample Totals.**

⚠ **CAUTION:** The system cannot perform routine fluidic activities while you are at the Diagnostics screen or while you are performing diagnostic tests. When you exit from the Diagnostics screen, the system may perform an extended calibration before you can use the system.

5. Touch **Diagnostics**.
6. Enter the service password, or use the password of the day.

   The Diagnostics screen appears.

7. Touch **AQC Valve.**
8. Touch **Start.**

   The position number on the display is at 1. The AQC valve does not move.

9. Touch **Change** to move the valve to the next position.

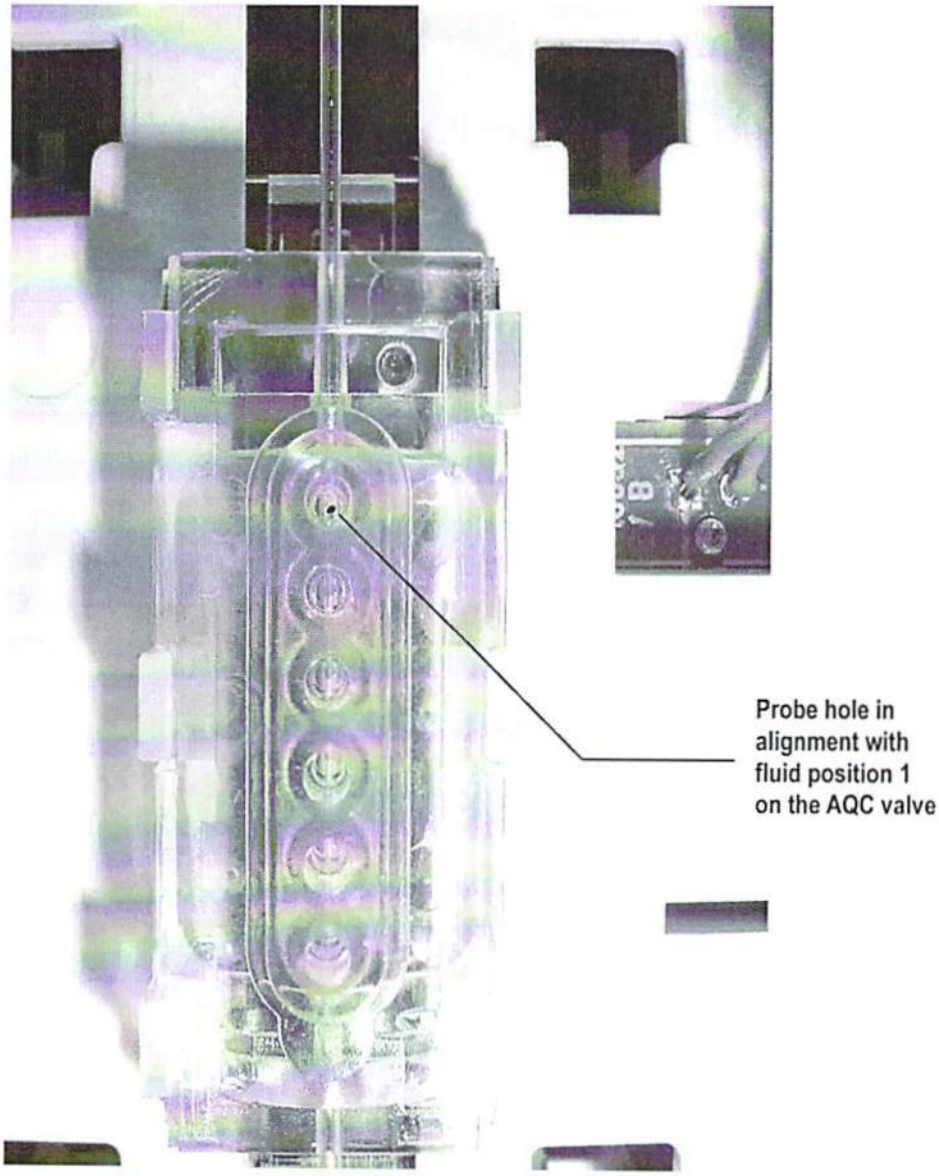
   The position number on the display changes to 2. The system moves the valve to fluid position 1.

10. Verify that the probe hole is aligned with the fluid position 1 hole.

11. Look for obstructions and listen for any unusual noises that may indicate a problem with the valve.

NOTE: Refer to the following figure, which shows how the AQC valve appears when the position number on the display is 2. The AQC valve is at fluid position 1 and is in alignment with the probe hole.

AQC Valve at Fluid Position 1



12. Touch **Change**.

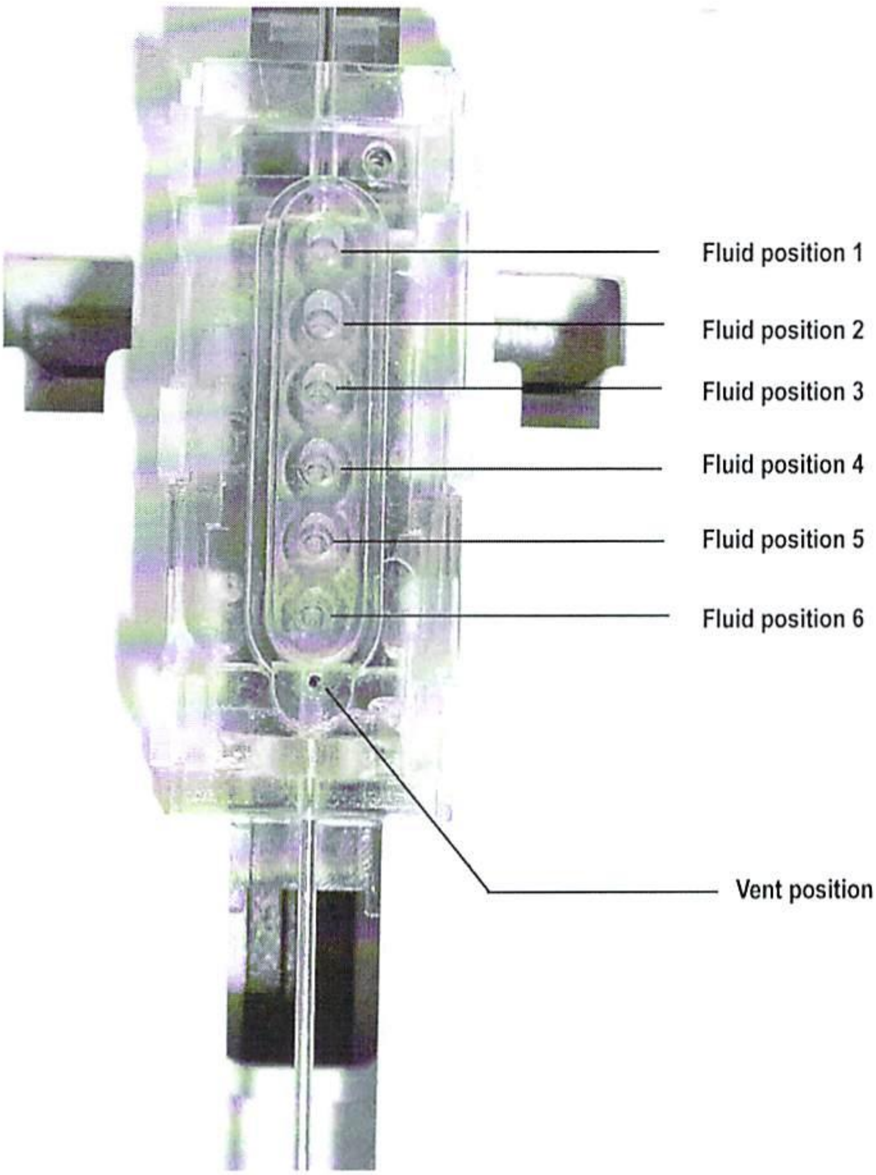
    The system moves the valve to the next position.

13. Verify alignment by observing the probe hole.

14. Continue to touch **Change** until all fluid positions are observed.

    Refer to the following figure which shows the fluid positions on the AQC valve.

AQC Valve Fluid Positions

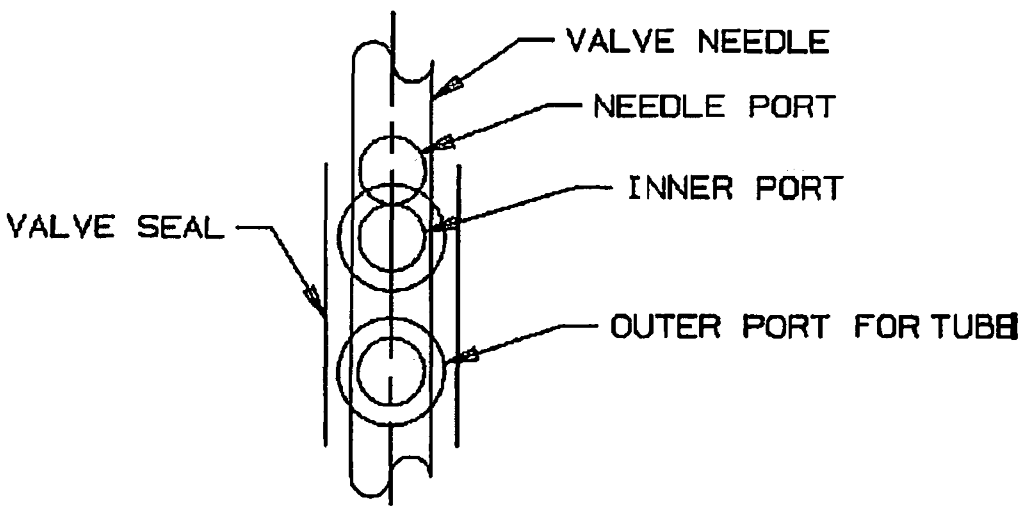


NOTE: The AQC valve positions are tested twice during the alignment test. Once with the measurement cartridge valve in the wash position and again with the valve in the ventAQC position. For positions 1 - 7 as indicated on the display, the measurement cartridge valve is in the wash position. After position 7 the valve changes to the ventAQC position, and the AQC valve positions are tested again (positions 8 - 14).

The following table lists the fluid positions observed on the AQC valve for each corresponding position indicated on the display:

Position Indicated on Display	Fluid Position Observed on AQC Valve
1	vent (not in position at start of test)
2	1
3	2
4	3
5	4
6	5
7	6
8	vent
9	1
10	2
11	3
12	4
13	5
14	6

AQC Valve Alignment (minimum acceptability)



NOTE: The criteria for a pass on each of the valve positions is determined by the ability to see any edge of the probe hole.

Testing the IDEE ROM and Cartridge Connector Switch.

NOTE: Ensure that the AutomaticQC option is turned on in Setup.

If you want to . . .	Then . . .
test the IDEE ROM and the cartridge connector switch	continue with step 15.
complete the valve alignment test	go to step 19.

15. Touch the **Continue** button until you return to the Status screen.

    The message informing you that the AQC cartridge needs replacing appears.

16. Touch **Cancel** to remove the message.

17. View the messages in the Event Log on the Status screen.

If . . .	Then . . .
the AQC Cartridge Not Valid message appears	the system is able to read the IDEE ROM.
the No AQC Cartridge message appears	the system cannot read the IDEE ROM.

18. If the system is able to read the IDEE ROM, test the cartridge connector switch.

    a. Move the switch on the cartridge simulator to the OFF position and view the Events Log.

If . . .	Then . . .
the AQC Connector is Open message appears	the system is able to see the connector switch.
this message does not appear	the system is unable to see the connector switch.

    b. When the switch is moved back to the ON position, the message disappears.

19. Return to the Diagnostics screen.

20. When the test is complete, put the AQC cartridge simulator switch in the OFF position.

⚠ **CAUTION:** Be careful to prevent the simulator from being ejected clear of the system.

21. Touch **Stop** when the test is complete.

    The AutomaticQC cartridge simulator is ejected.

22. Manually position the valve in the AutomaticQC cartridge simulator back to the Start position.

23. If alignment was not achieved, replace the AQC frame. Refer to *Replacing Components*.

    Wait while the system returns the valve to the correct position.

24. Touch **Continue** button three times to return to the Analysis screen.

Lamp Calibration Test

Use this procedure to test the CO-ox halogen lamp to check proper lamp operation and associated power driver and control circuitry. This test is also used to perform a lamp calibration. During the test, the lamp is turned on using the most recent lamp calibration settings, and a full lamp calibration and diagnostic test is performed.

NOTE: Perform this test whenever the lamp is changed or whenever the lamp is removed and reinstalled.

1. Touch the **Recall** button.
2. Touch **Sample Totals**.

⚠ **CAUTION:** The system cannot perform routine fluidic activities while you are at the Diagnostics screen or while you are performing diagnostic tests. When you exit from the Diagnostics screen, the system may perform an extended calibration before you can use the system.

3. Touch **Diagnostics**.
4. Enter the service password, or use the password of the day.

   The Diagnostics screen appears.

5. Touch the **Lamp Cal** button.

   All buttons are disabled and the system performs the Lamp Calibration test.

6. The system turns off the lamp.

7. The test results are printed as PASS or FAIL.

   The tHb icon is set to the Not-In-Cal state regardless of test outcome and the tHb icon returns to Cal at the next one-point calibration.

Wavelength Calibration Test

Use this test to check the neon lamp operation, the optical path of the sample chamber, polychromator measurement functions, and polychromator alignment.

NOTE: This test may be run with or without a measurement cartridge in place.

1. Ensure that the door is closed.
2. Touch the **Recall** button.
3. Touch **Sample Totals**.

⚠ **CAUTION:** The system cannot perform routine fluidic activities while you are at the Diagnostics screen or while you are performing diagnostic tests. When you exit from the Diagnostics screen, the system may perform an extended calibration before you can use the system.

4. Touch **Diagnostics**.
5. Enter the service password, or use the password of the day.

   The Diagnostics screen appears.

6. Touch the **Wavelength Cal** button.

   All keys are disabled, the sample chamber is in the closed position, and the lamp turns on.

   The system measures the neon spectrum, calculates the neon line centroid and compares it with alignment centroid of same line stored in the polychromator to calculate polychromator shift.

7. The test results are printed as follows:
   - Neon line's mean peak counts
   - Neon line's SD of peak counts
   - Current neon line centroid (in pixels)
   - Neon centroid from polychromator alignment (in pixels)
   - Polychromator shift = current neon line centroid minus alignment centroid (in pixels)

   In addition to the numerical values, a PASS/FAIL result is provided for the peak counts.
   - Minimum mean peak counts are 375
   - Maximum polychromator shift is 1.5.

Lamp On/Off Test

Use the CO-ox On/Off Lamp test to check halogen lamp operation and associated power driver and control circuitry.

This test may be used to directly turn the lamp on and off using the most recent lamp calibration settings to control the intensity of the lamp while diagnosing problems with the illumination system.

NOTE: This test may be run with or without a measurement cartridge in place.

1. Touch the **Recall** button.
2. Touch **Sample Totals**.

⚠ **CAUTION:** The system cannot perform routine fluidic activities while you are at the Diagnostics screen or while you are performing diagnostic tests. When you exit from the Diagnostics screen, the system may perform an extended calibration before you can use the system.

3. Touch **Diagnostics**.
4. Enter the service password, or use the password of the day.

   The Diagnostics screen appears.

NOTE: The CO-ox Lamp On/Off button toggles the CO-ox lamp on or off.

5. Touch the **CO-ox Lamp On/Off** button.

   The CO-ox lamp turns ON,

6. Touch the **CO-ox Lamp On/Off** button a second time.

   The CO-ox lamp turns OFF.

NOTE: The system automatically turns the lamp off when you exit the Diagnostics screen.

Sample Chamber Test

Use the Sample Chamber test to verify that the sliding sample chamber moves to the closed and open positions and to check the operation of the sample chamber drive/interface and associated electronics in the sample chamber interface assembly.

NOTE: During run-time the sample chamber opens and closes to perform the most optimum wash of the CO-ox optical chamber. An error flag indicating a sample chamber position error is detected if the sample chamber fails to move to the targeted position during testing.

NOTE: A measurement cartridge or a measurement cartridge simulator must be in place when this test is run.

1. Touch the **Recall** button.
2. Touch **Sample Totals**.

⚠ **CAUTION:** The system cannot perform routine fluidic activities while you are at the Diagnostics screen or while you are performing diagnostic tests. When you exit from the Diagnostics screen, the system may perform an extended calibration before you can use the system.

3. Touch **Diagnostics**.
4. Enter the service password, or use the password of the day.

   The Diagnostics screen appears.

5. Touch the **Sample Chamber** button.

   The second Diagnostic screen appears.

6. Touch the **Start, Change**, and **Stop** buttons sequentially to run the test

7. The system prints the test results as PASS/FAIL:

If . . .	Then the system response is . . .
the sample chamber is left in the open position	Pass.
the cell remains in the closed position	Fail. A D73 is posted and CO-ox sample analysis remains disabled.

Shutting Down the System

Use this procedure to remove power from the system.

To prevent electrical shock or damage to the system, remove power from the system only as described in this procedure.

1. If prompted, enter your password, the service password, or the password of the day.
2. Touch the **Status** button.
3. Touch **Shutdown**.

CAUTION: Cartridges installed in the system remain stable for 60 minutes without power. To maintain cartridge stability, do not remove power from the system for more than 60 minutes if a cartridge is installed.

4. When prompted, turn the power switch off.

   The power switch is located on the rear panel of the system.

5. To restore power to the system, turn the power switch on.

   After the Rapidpoint 400 series system title screen appears, the Wait screen displays the time remaining until you can use the system. The Analysis screen appears when the system is ready to analyze samples.

Recovering from a Power Loss

Cartridges installed in the system remain stable for 60 minutes without power. If power is removed from the system for less than 60 minutes, you can resume operating the system without replacing cartridges.

If power is removed from the system for more than 60 minutes, prepare the system for use as follows:

1. If the system was turned off, turn the power switch on.

   The power switch is located on the rear panel of the system.

   The system displays the Rapidpoint 400 series system title screen.

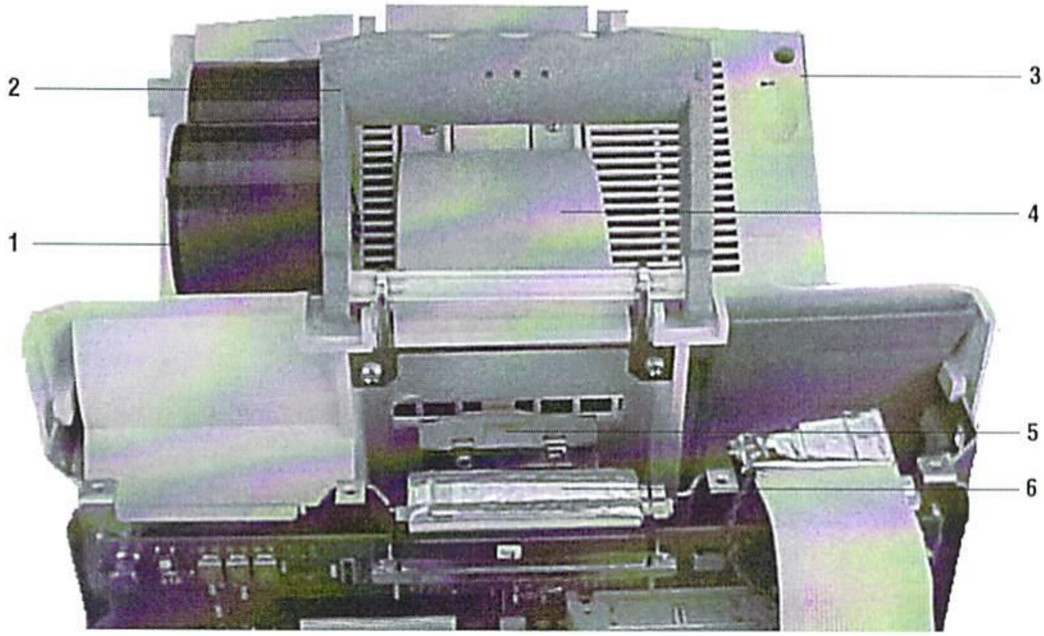
2. If prompted, replace the cartridges. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.*

   The Wait screen displays the time remaining until you can use the system. The Analysis screen appears when the system is ready to analyze samples.

Illustrated Parts Lists

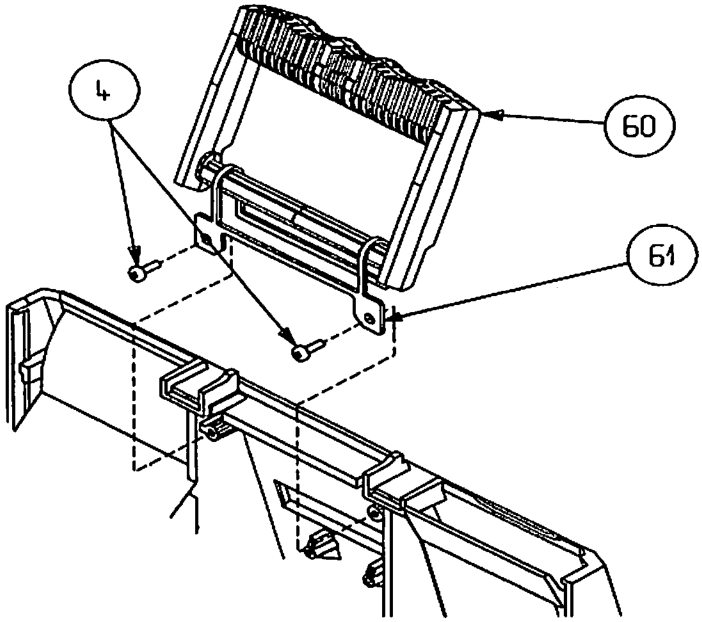
Main Assembly Illustrations

System Frame (rear view)

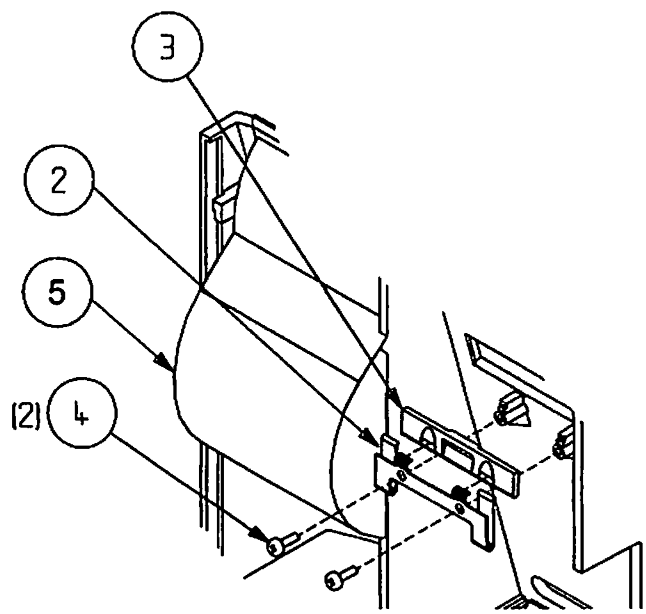


1 Paper cover
2 Handle
3 Display printer assembly
4 Display support
5 Spring pawl shown in the forward position
6 Display cable

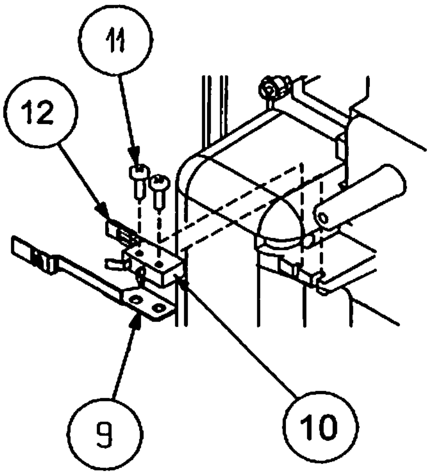
Handle



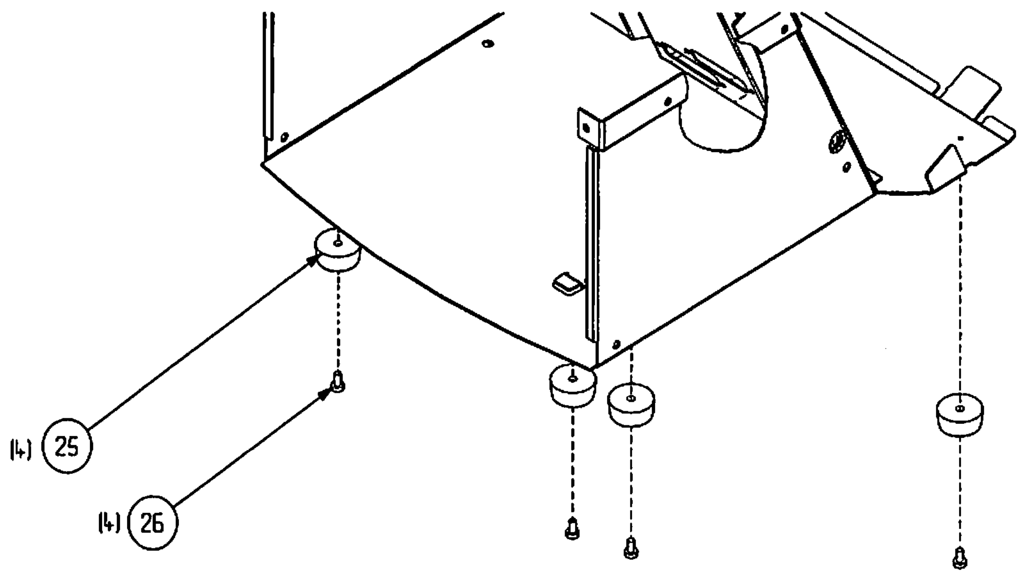
Pawl



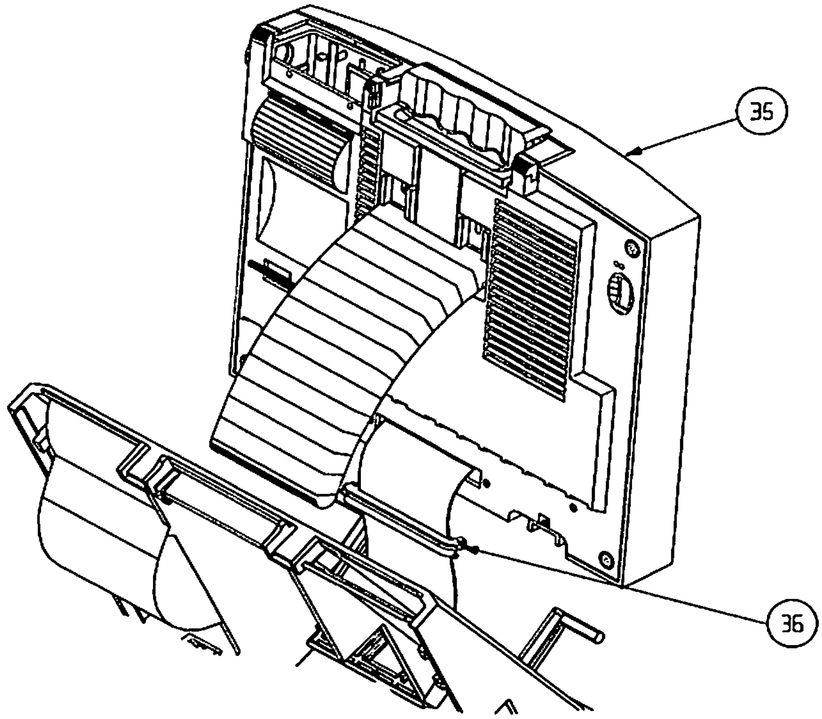
Wash/Waste Switch



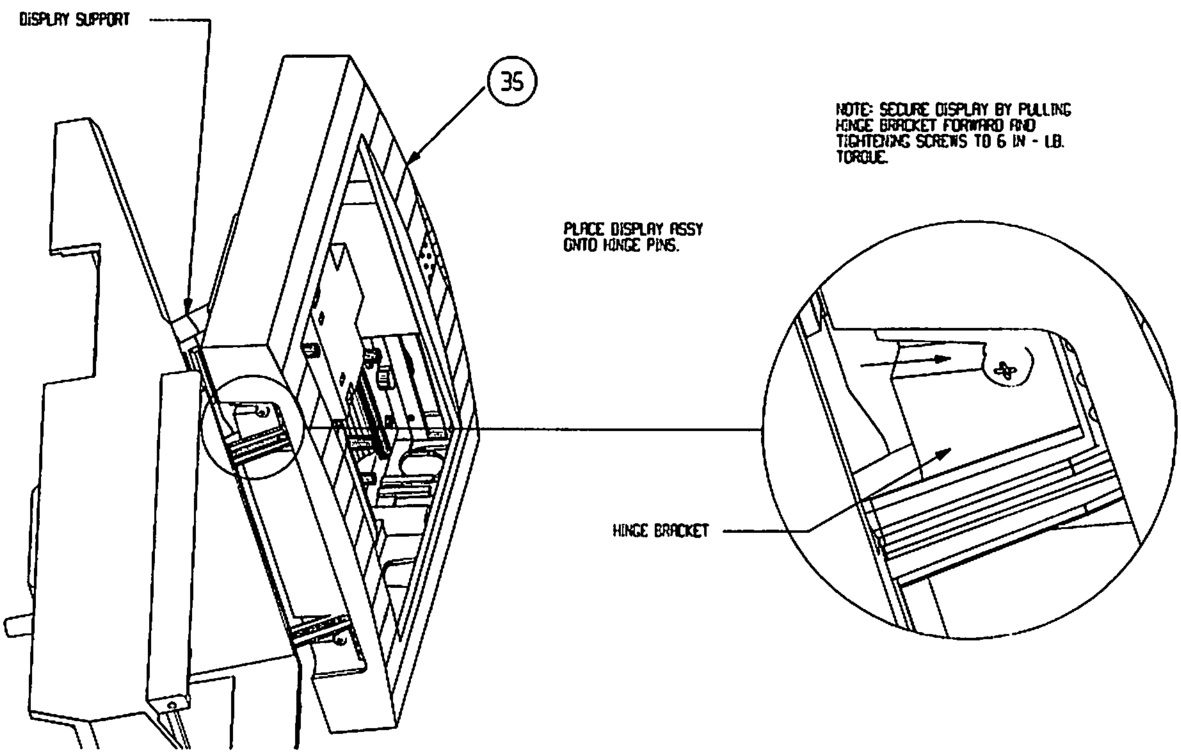
Rubber Feet



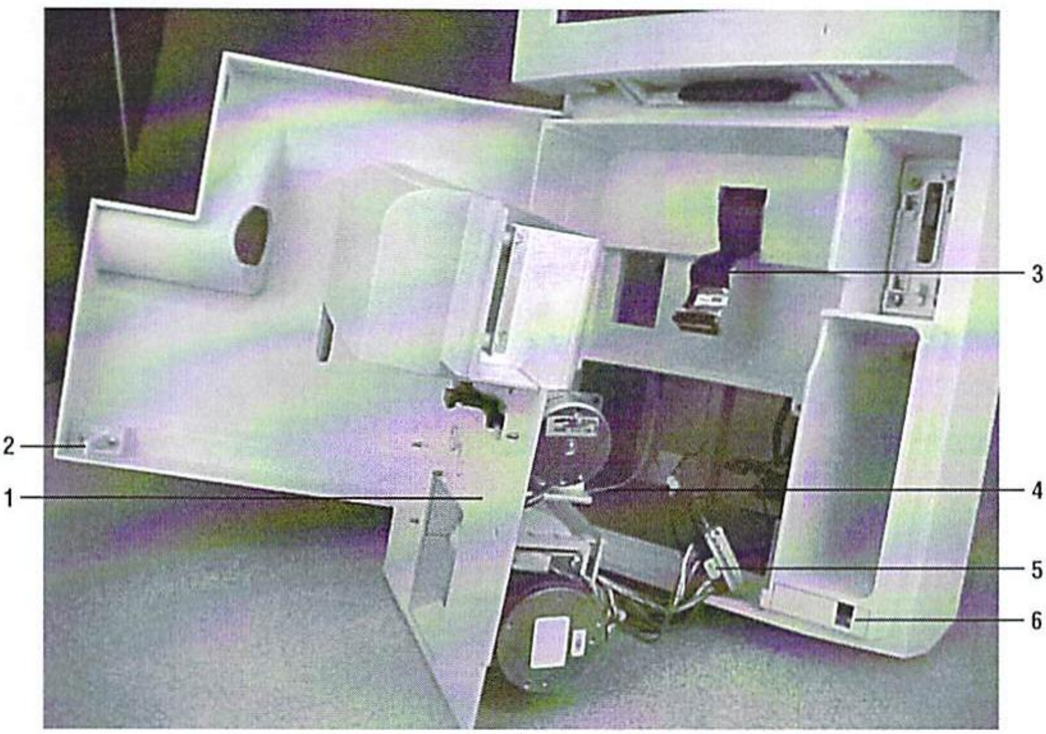
Display



Display Bracket

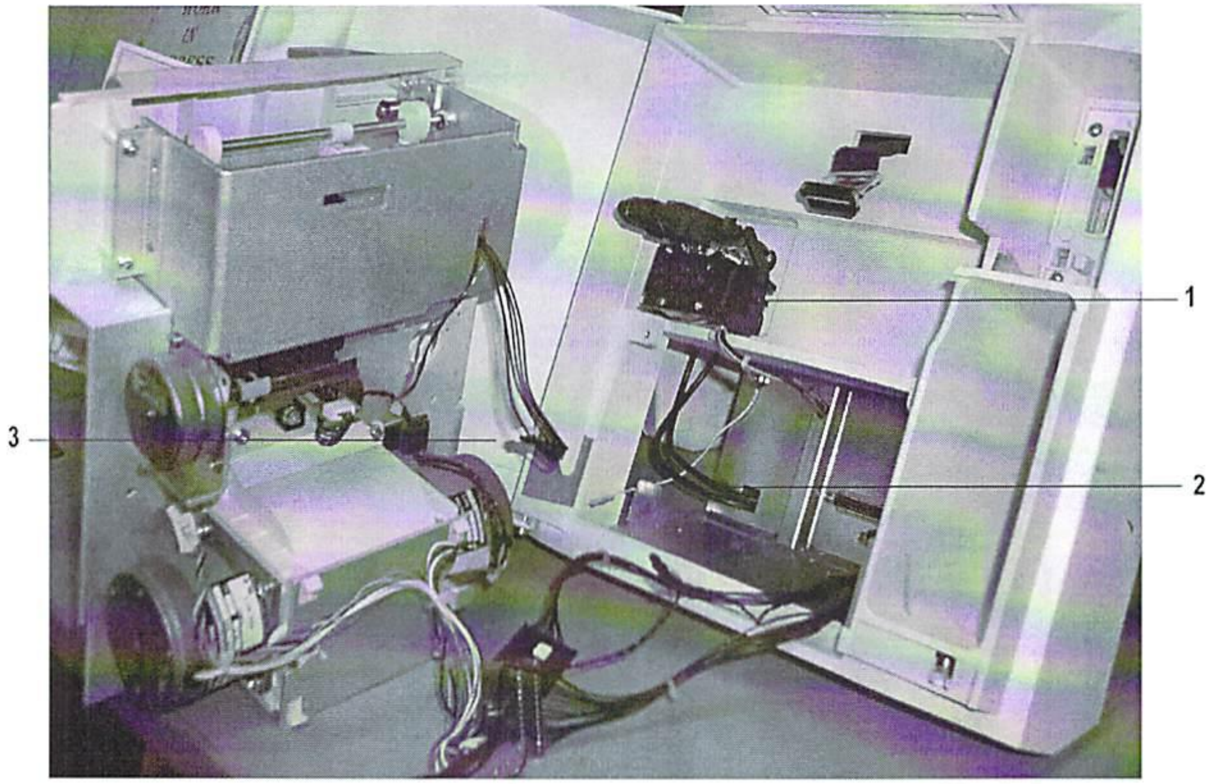


Front View of the System (Rapidpoint 400 System)



1 Cartridge interface assembly
2 Door hook
3 Pre amp cable
4 EDS Ground strap
5 Outboard cable harness
6 Door switch

Front View of the System (Rapidpoint 405 System)

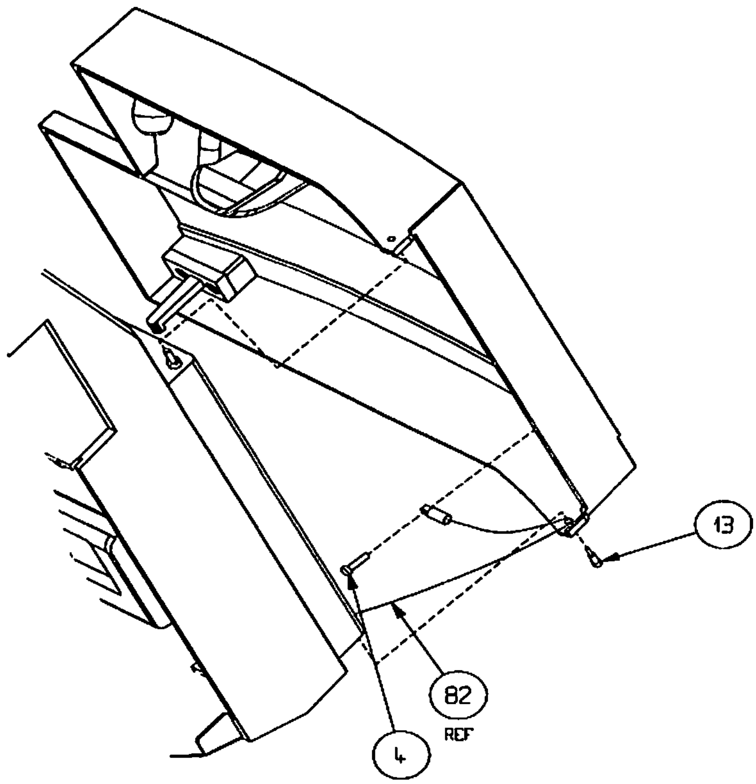


1 CO-ox sample chamber interface assembly

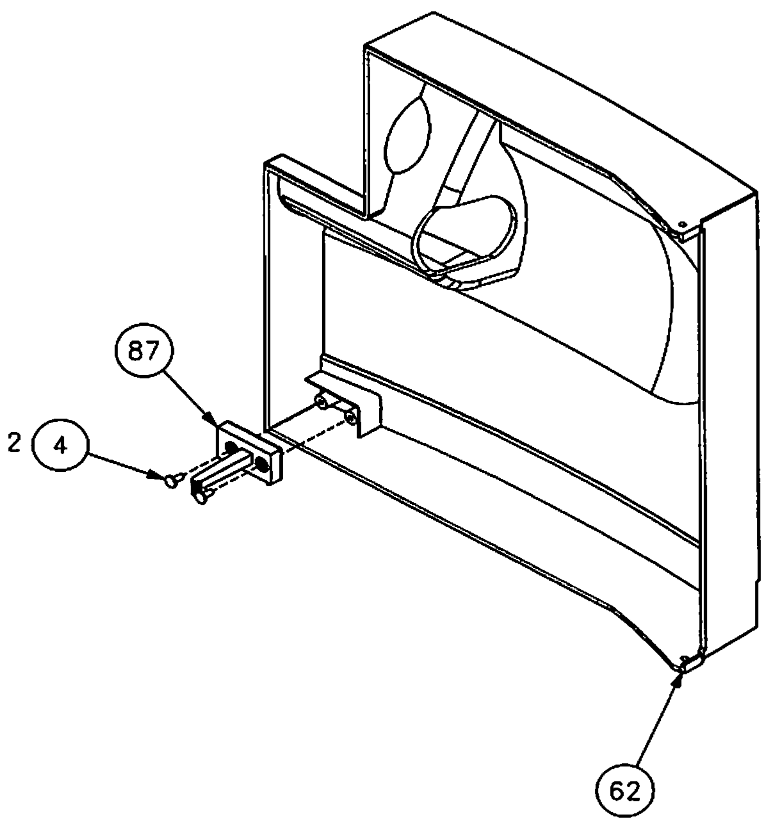
2 Fiber bundles

3 5 pin connector

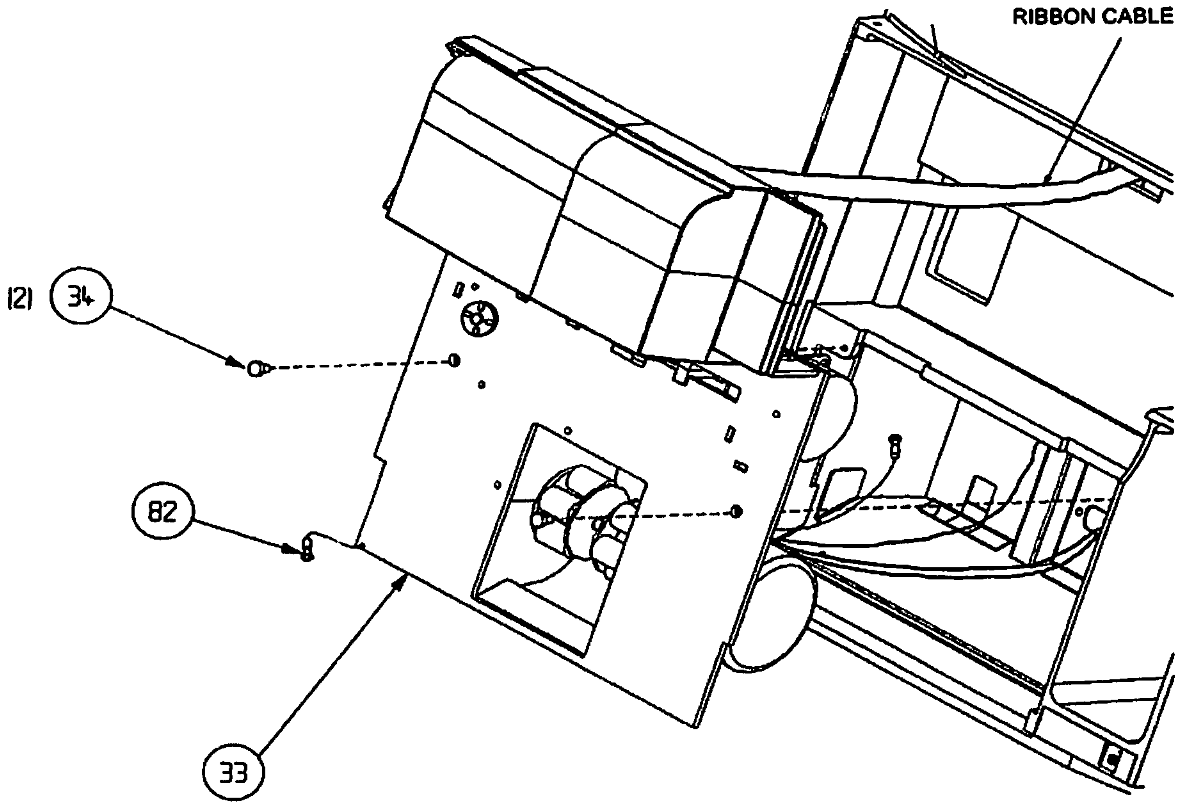
Front Door



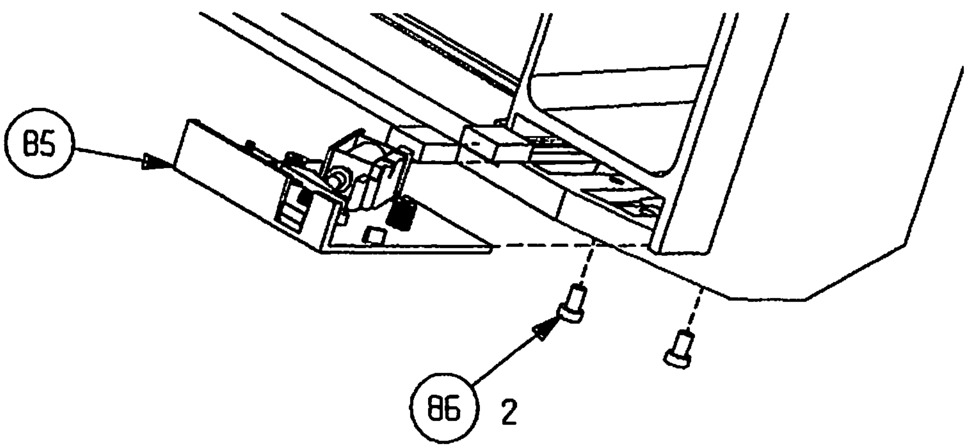
Door Hook



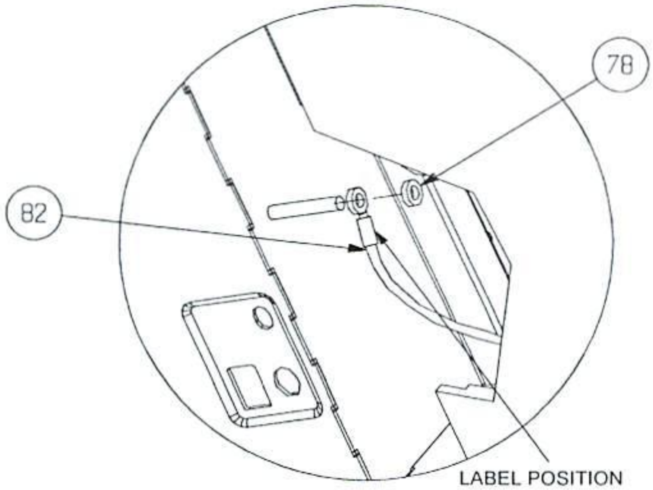
Cartridge Interface Assembly (Front)



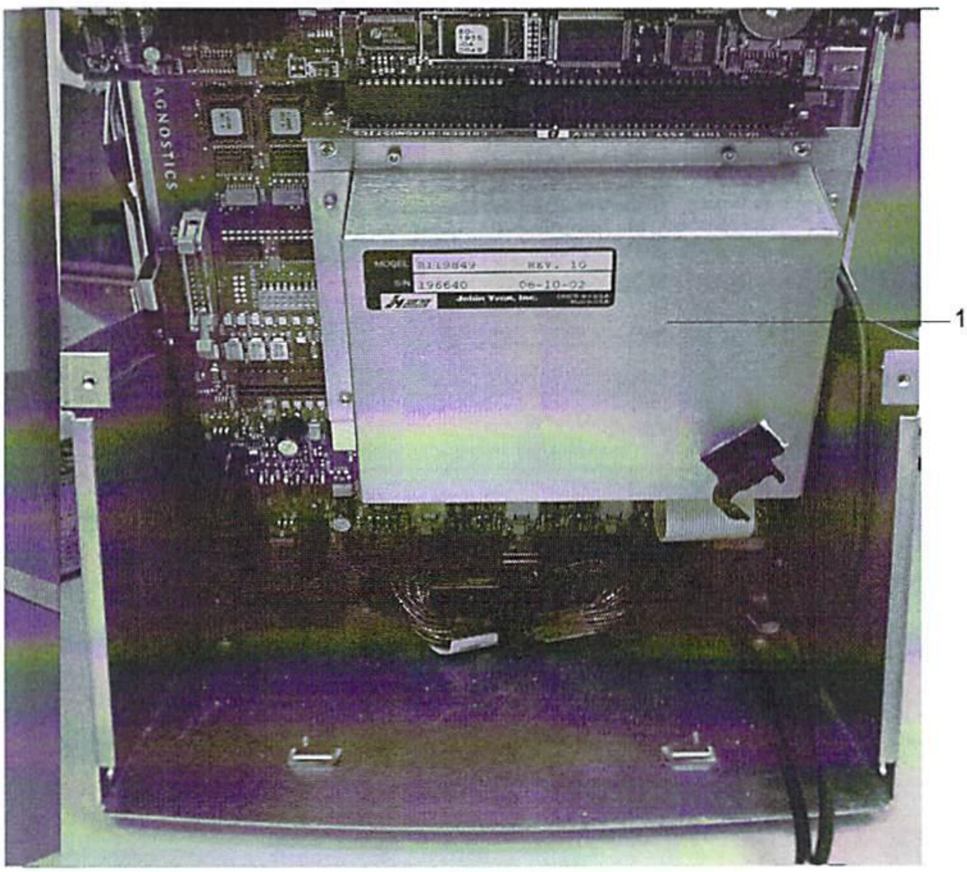
Door Switch



ESD Ground Strap

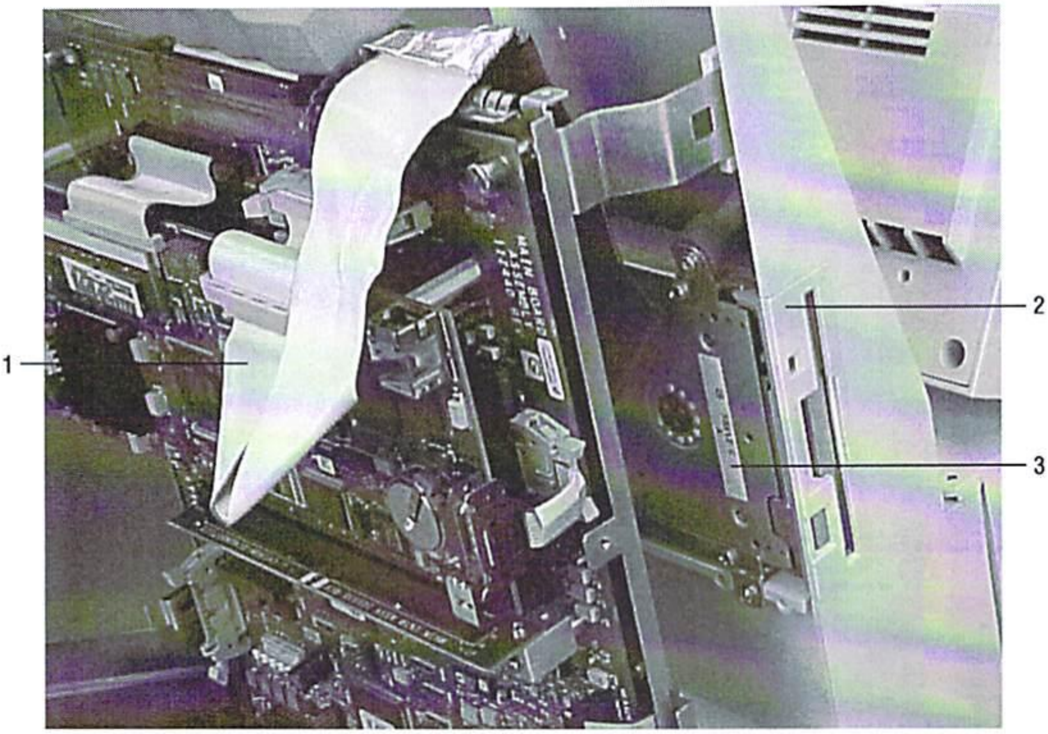


Polychromator Module



1 CO-ox polychromator module

Diskette Drive

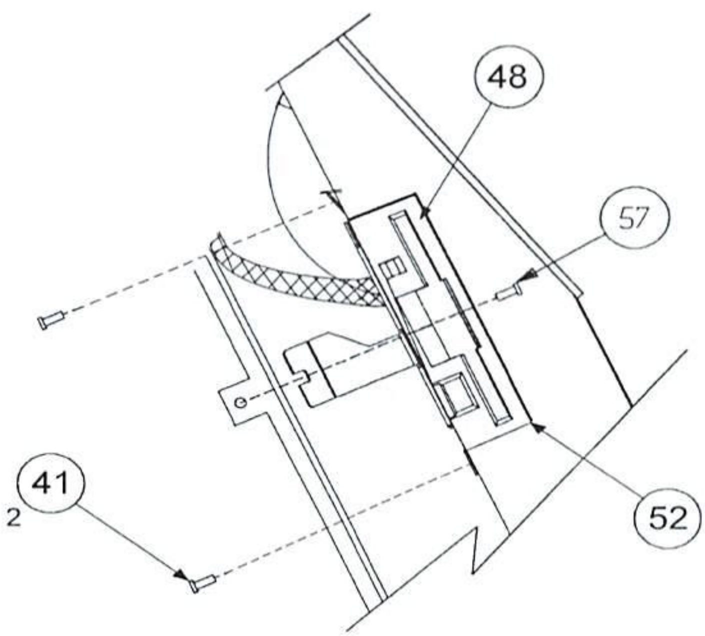


1 Diskette drive cable

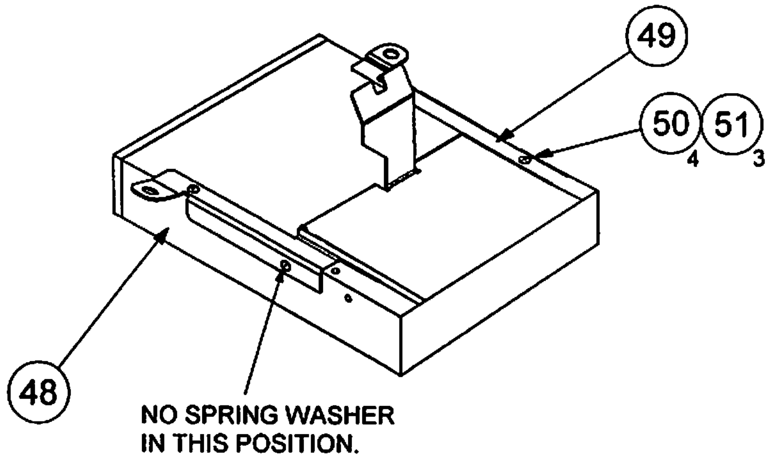
2 Diskette drive fascia

3 Diskette drive

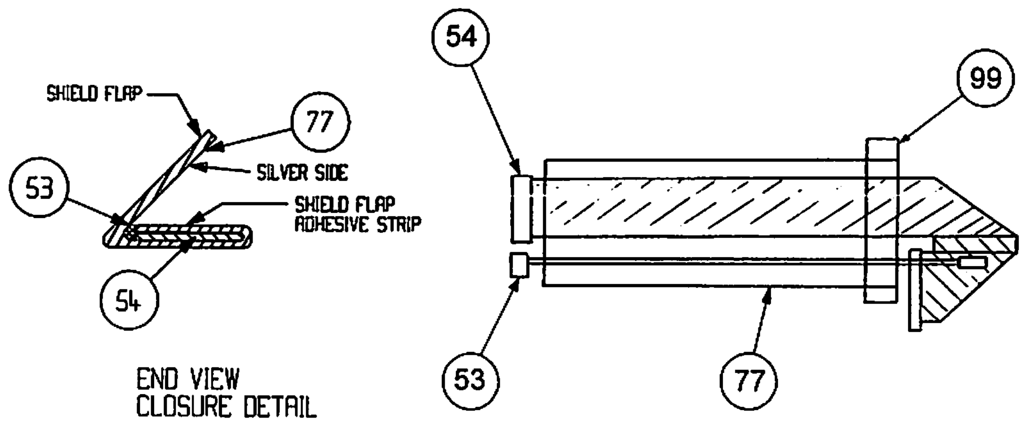
Diskette Drive (Side)



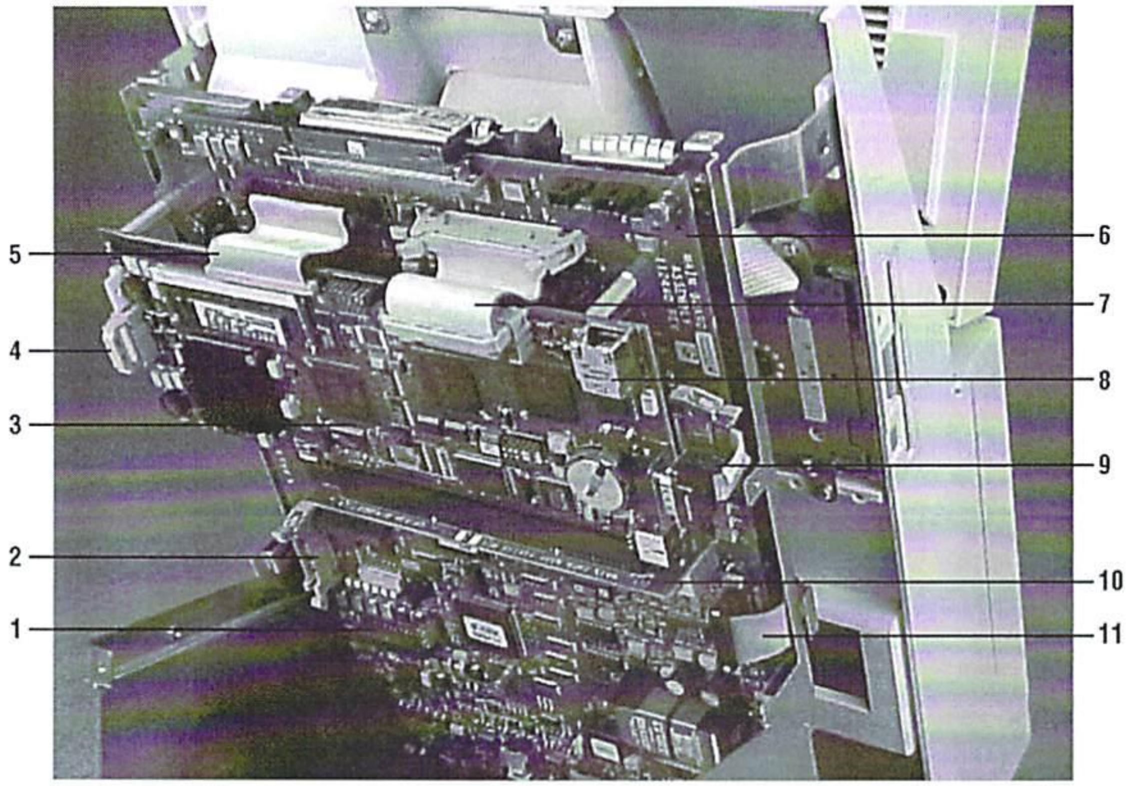
Diskette Drive



Diskette Drive Cable Shield

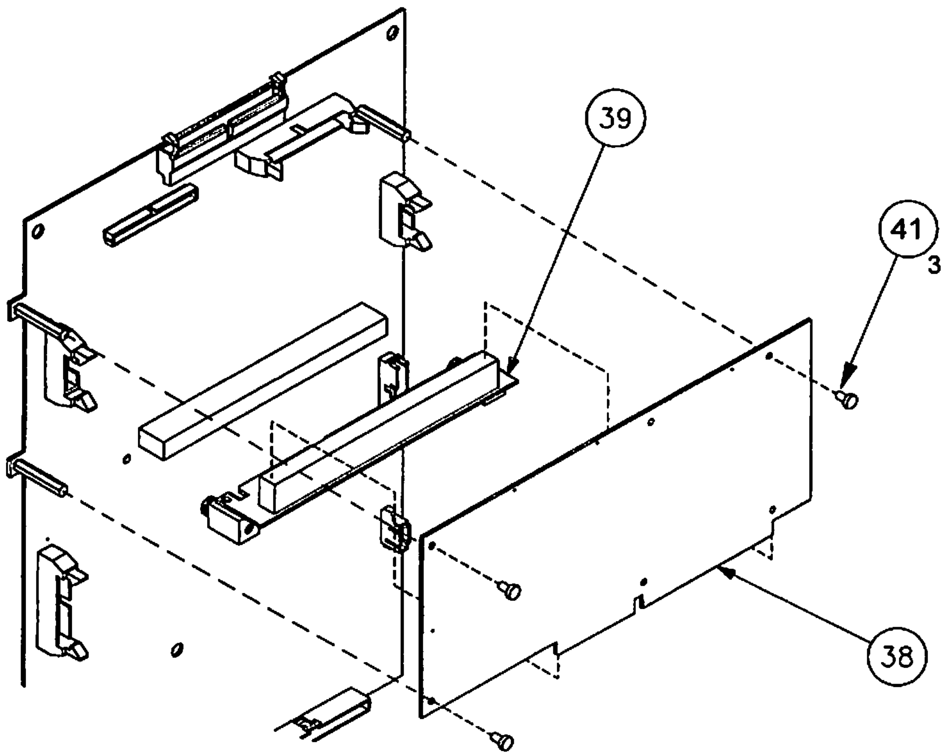


PCB Boards and Cables

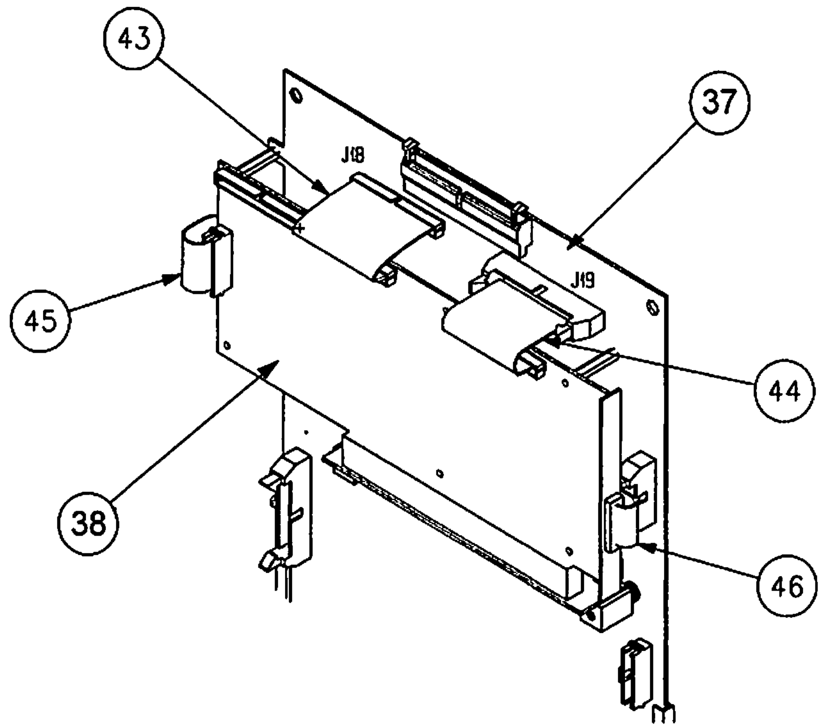


1 Connector for the rear interconnect cable
2 Connector for the power harness
3 UIP board
4 UIP utility cable
5 UIP display cable
6 Main board
7 UIP LPD/Com 2 cable
8 Connector tor the patch cable
9 UIP Com/Inboard cable
10 Main interconnect board
11 Preamp cable

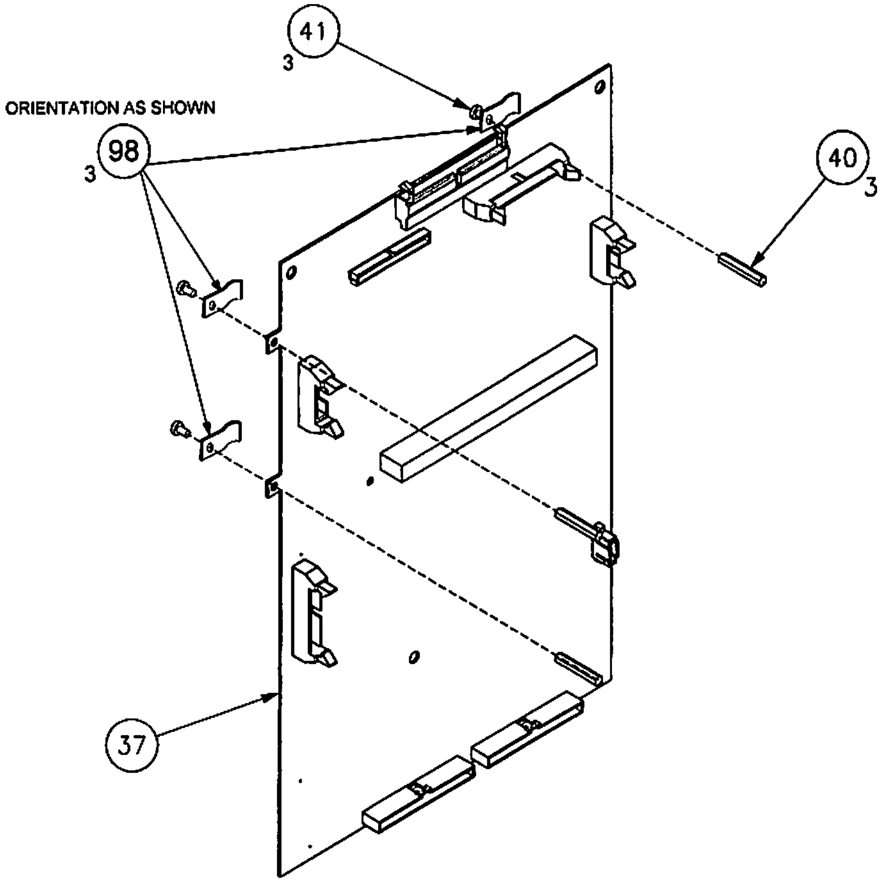
Connector/UIP PCB



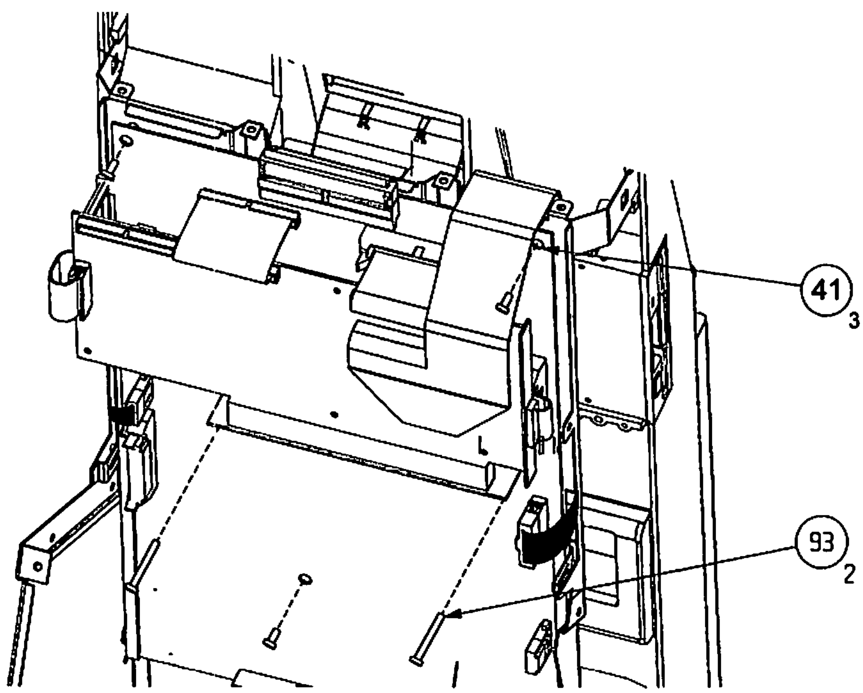
UIP PCB with Cables



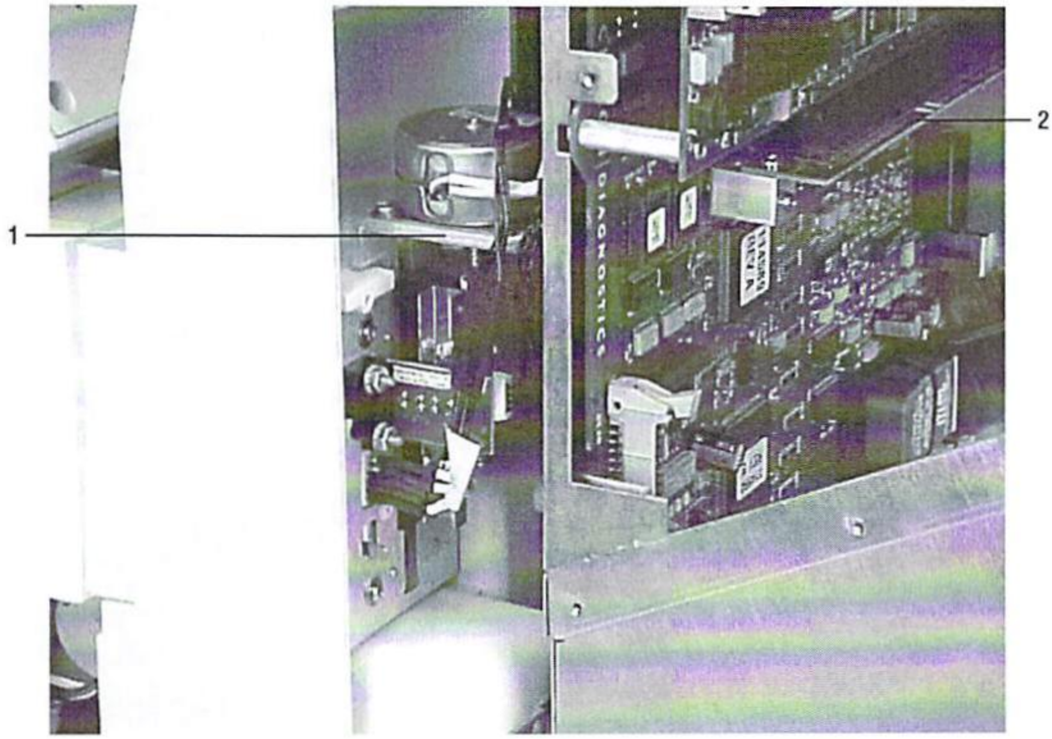
Main PCB



Main PCB Attached to Frame



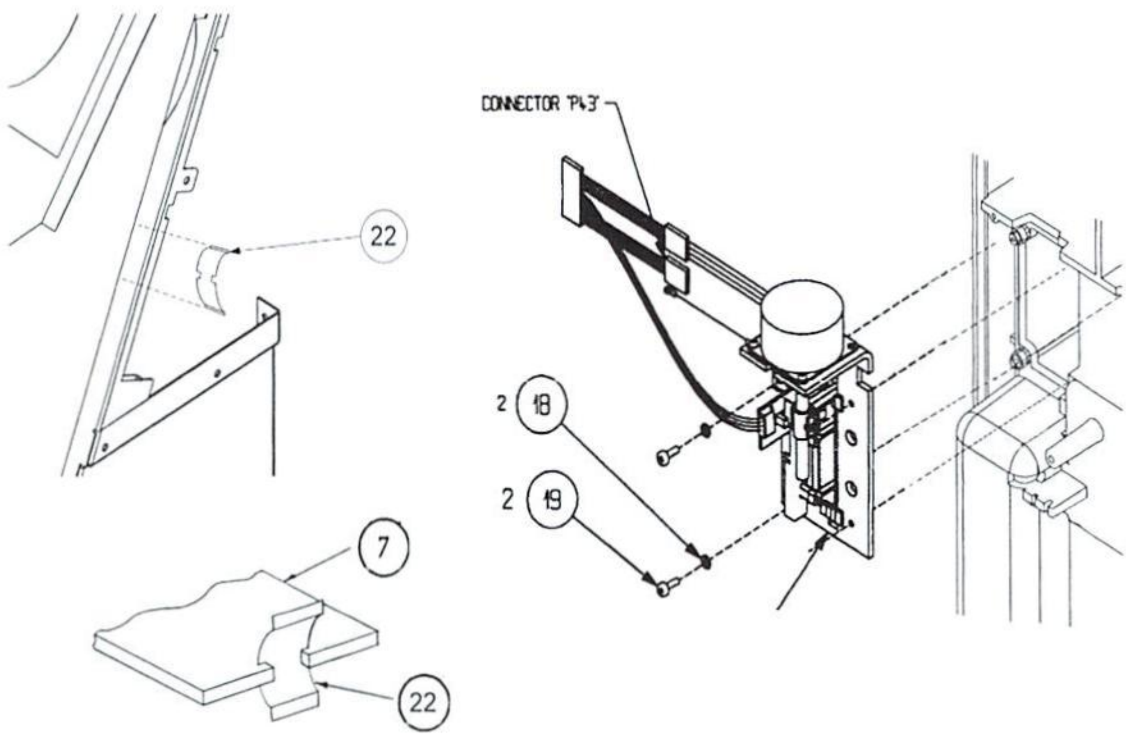
AQC Frame Assembly



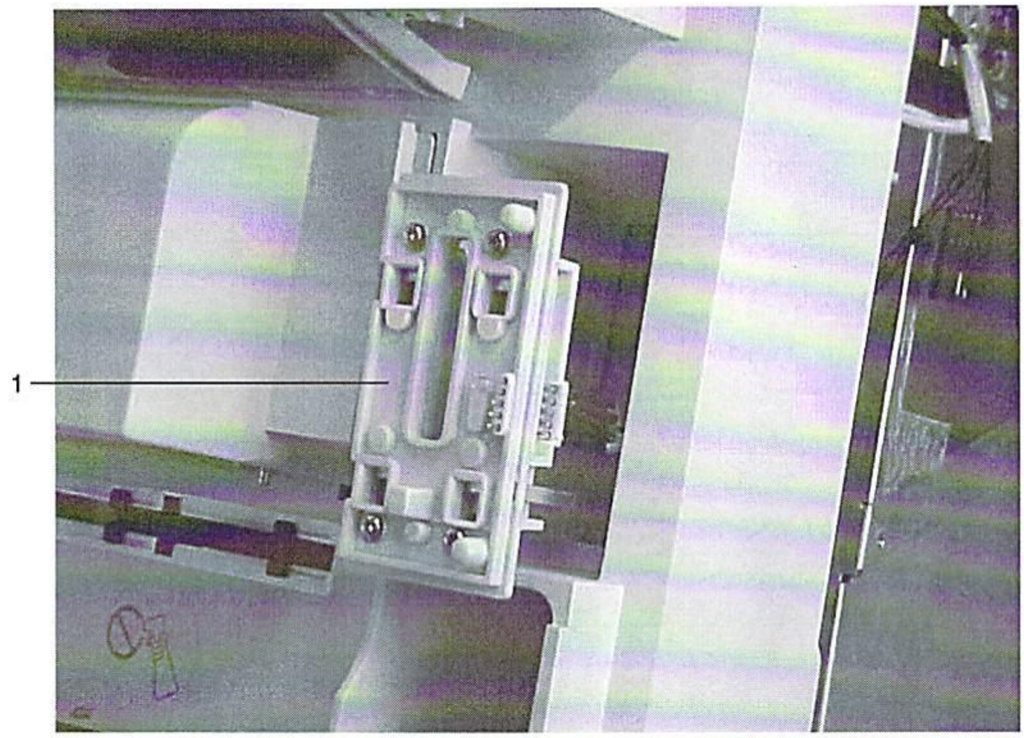
1 AQC frame assembly

2 Main Interconnect board

AQC Frame Assembly

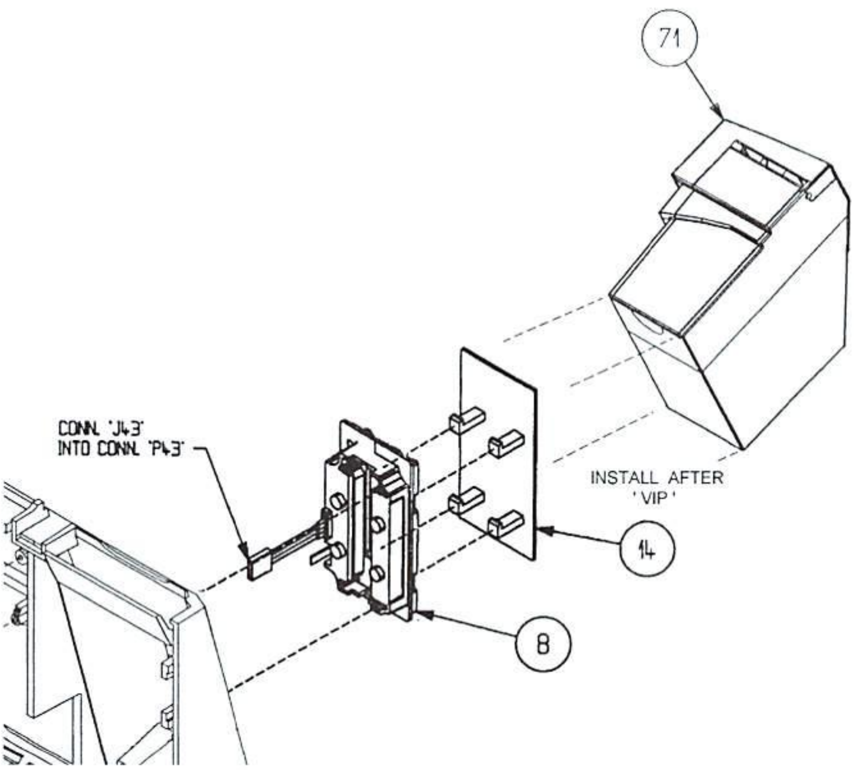


AQC Latch Assembly Front View

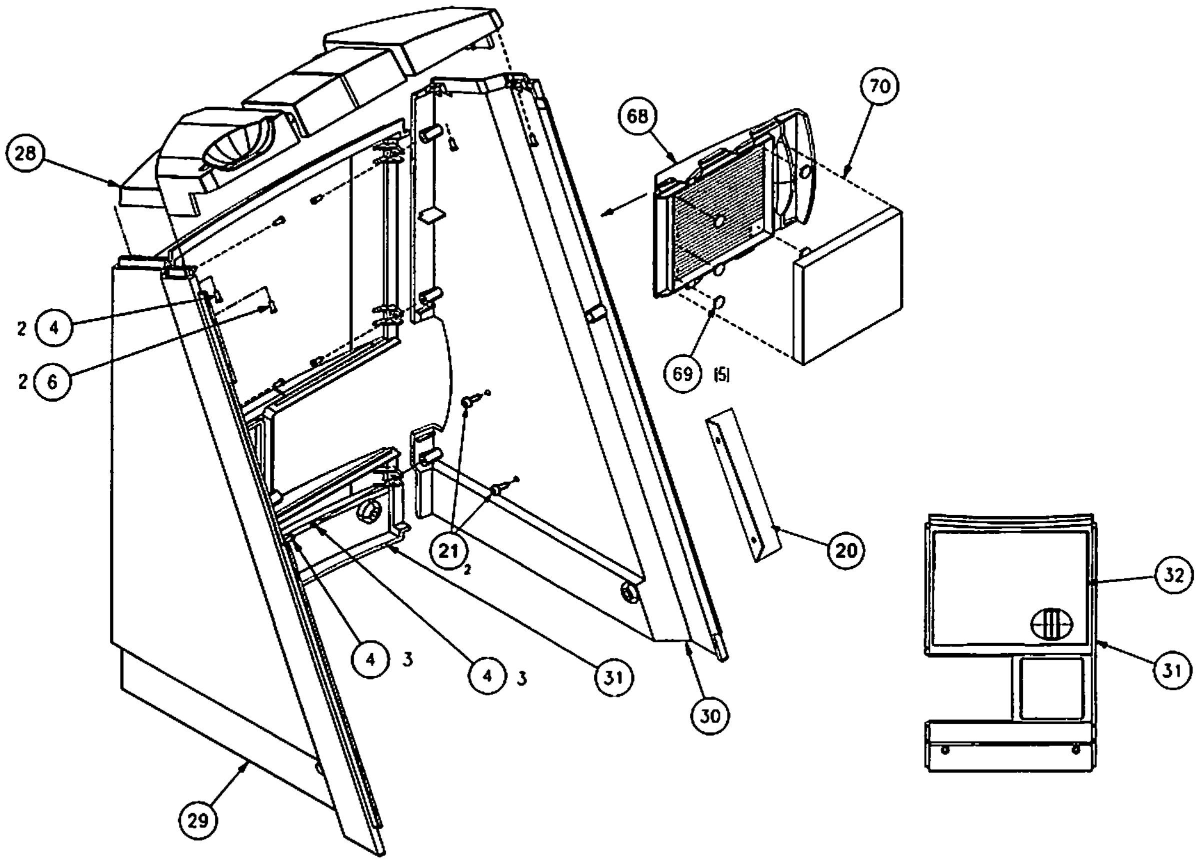


1 AQC latch assembly

AQC Latch Assembly Rear View



Cover



Main Assembly Parts List

Item	Description	Manufacturing Part	Service Part
	CO-ox Polychromator Module		130594
	CO-ox Sample Chamber Interface Assembly		131530
2	Pawl Spring	105474	131609 (kit)
3	Pawl Flipper	108687	131609 (kit)
4	Screw, Thread-forming 6-19	823693006	131609 (kit)
6	Screw, Thread-forming 0.120 diameter	109000	
7	Frame Assembly, AQC	113505	126672
8	Latch Assembly, AQC	113510	126673
9	Bracket, Wash/Waste Switch	109087	
10	Wash/Waste Switch	570312	126864 (kit)
11	Screw, Phillips Pan-head C12a SEMS	106144	126864 (kit)
12	Boot, Switch Lever	108686	126864 (kit)
13	Screw Shoulder 4-40 0.125 X 25	109232	
14	Panel, Access , AQC	120929	126794
18	Washer, Flat #4	823343003	
19	Screw, Thread-Forming 4	823693003	
20	Support Bracket, AQC	117251	
21	Screw, Thread-forming 6-19	109652	
22	Clip, AQC	121977	
25	Foot, Rubber, Recessed	823066010	122565
26	Screw, 4-4- X 0.38 Self-tapping	823808008	
28	Cover, Top	100262	
29	Cover, Left	100249	
30	Cover, Right	100248	
31	Cover, Back (Rear)	100234	
32	Label, Product Information	106141	
33	Cartridge Interface Assembly (kit)	100374	04018492

(Continued)

Item	Description	Manufacturing Part	Service Part
34	Screw, Flat 4-40 X 1/2	823339027	
35	Display Printer Assembly	117218	122557
36	Plug, Display Cable	102942	
37	PCB, Main 400	112440	122551
38	586/UIP EPC33 - 16	106147	122520
39	PCB, Main Interconnect	101235	122562
40	Standoff, 1/4 Hex	105859	
41	Screw, Sems 4-40 X 1/4	823810023	
41	Harness, Inboard 1	113770	
43	UIP, Display Cable	570263	
44	Cable, Assembly UIP LPT1/COM2	570267	
45	Cable, Assembly UIP Utility	570268	
46	Cable, Assembly UIP COM1/Inboard	570272	
48	Drive, Disk DSDD 3.5 inch	122199	122530
49	Bracket, Disk Drive	100369	
50	Screw, Metric Pan-head	823705002	
51	Washer, Lock #4	823342003	
52	Fascia, Diskette Drive	106143	
53	Harness, Power Diskette	570254	
54	Cable Assembly, Diskette Drive	570255	
57	Screw 6-32 X 1/4 Long	823810043	
60	Handle, Instrument, Over-molded	105917	
61	Retainer, Handle	104573	
62	Door, Front (RP400)	102933	122532
62	Door, Front (RP405)		01983405
68	Grill, Air	100295	
69	Fastener, Velcro Hook 0.38 Diameter	105122	
70	Filter, Material	100379	122521
71	Ampule Breaker	100330	122564

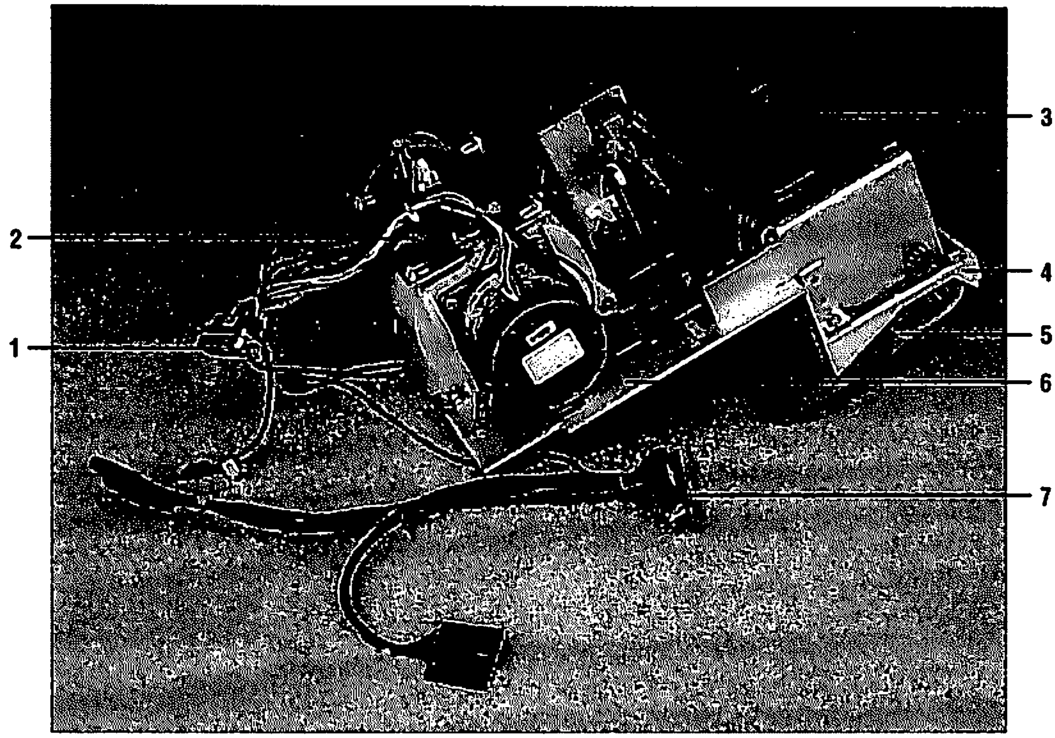
(Continued)

Item	Description	Manufacturing Part	Service Part
72	Screw, Phillips 6-32 X 1/2 SEMS	823810047	
77	Shield, Cable, Flex for 1.70 inch	109334	
78	Nut, KEP 6-32 SCP	823737005	
82	Strap, ESD Ground	110507	122566
84	Tape, Conductive	825025001	
85	Door Lock Assembly	116315	122561
86	Screw, Thread-forming 3-24	117671	
87	Door Hook		126788
89	Harness, Inboard 2	113523	
93	Screw, Pan-head 40 X 1.25 Long	117417	
96	Bushing	121036	
97	Cable, Clamp	823383001	
98	Clip	122154	
99	Tape, Conducting	825025001	

When ordering a kit, all items with the same RSL part number are included in the kit.

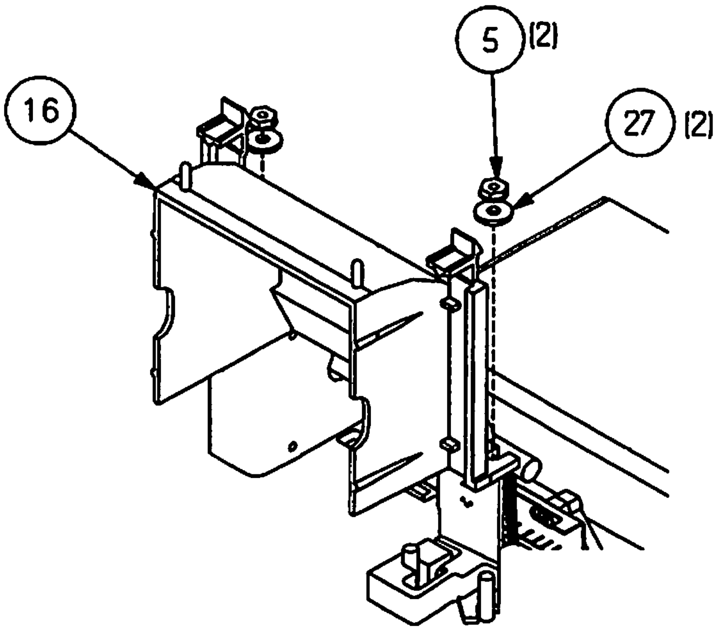
Cartridge Interface Assembly Illustrations

Cartridge Interface Assembly

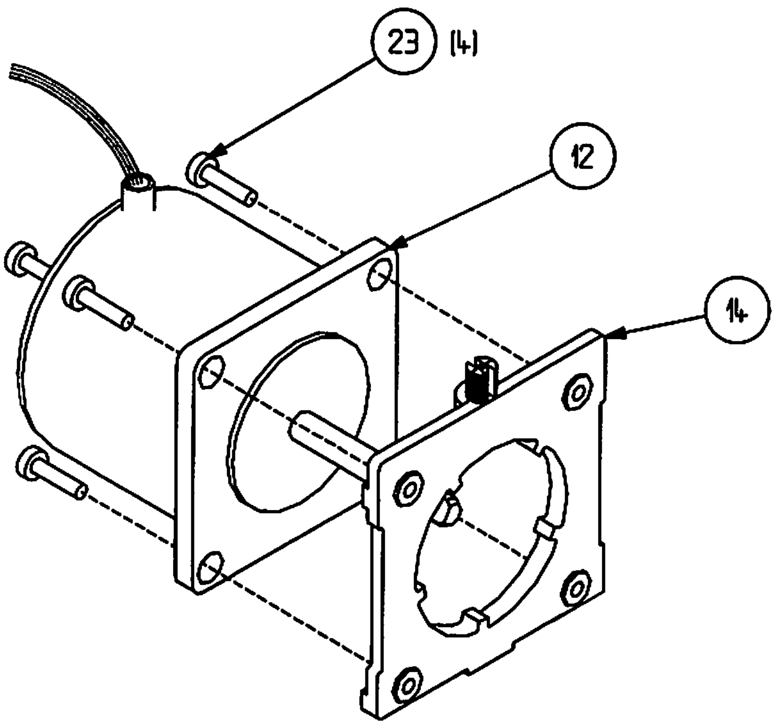


1 Outboard cable harness
2 Spring plate
3 Connector block
4 Thermal cover
5 Cartridge handle
6 Cartridge interface frame
7 Outboard cable harness

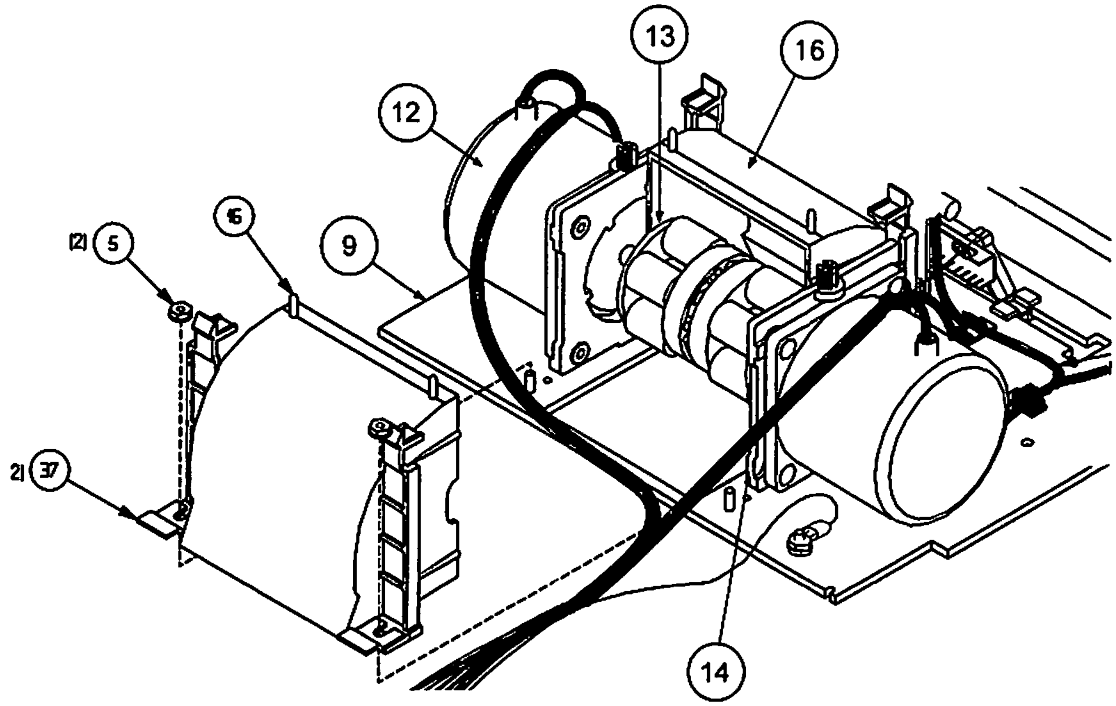
Pump Housing



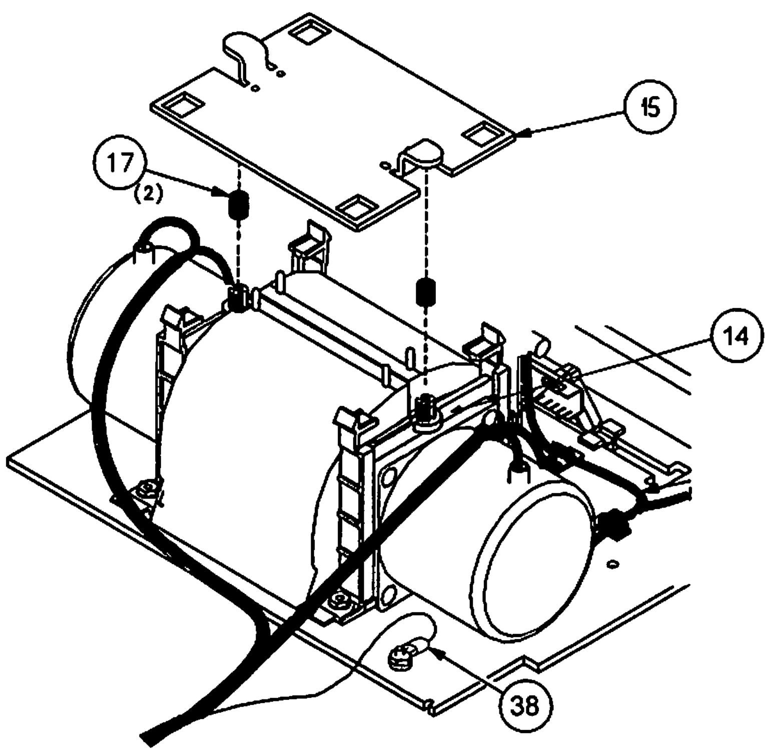
Peri-pump Motor and Mount



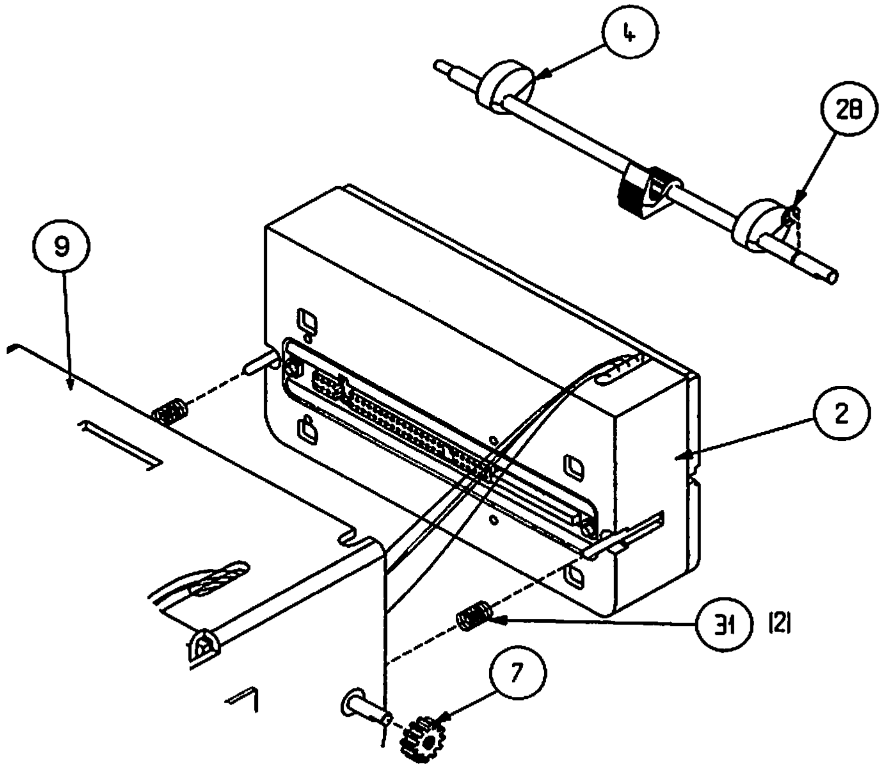
Peri-pumps



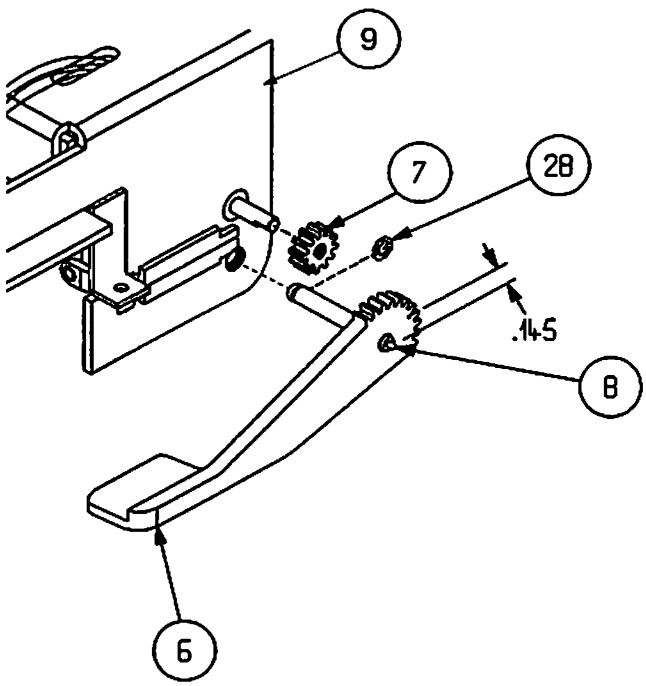
Spring Plate



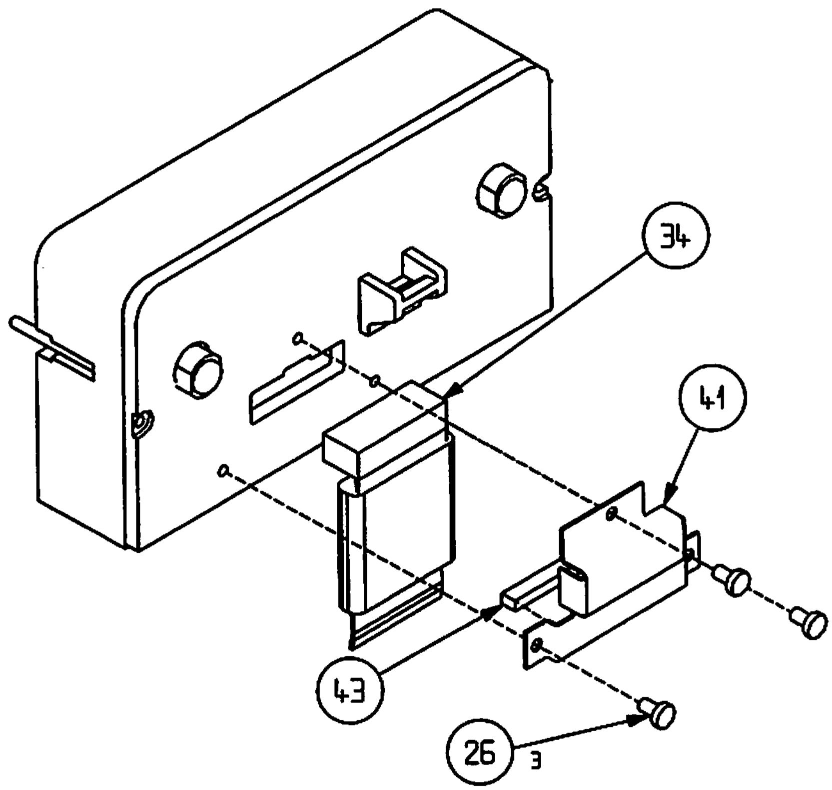
Connector Block



Cartridge Handle



Preamp Cable Cover



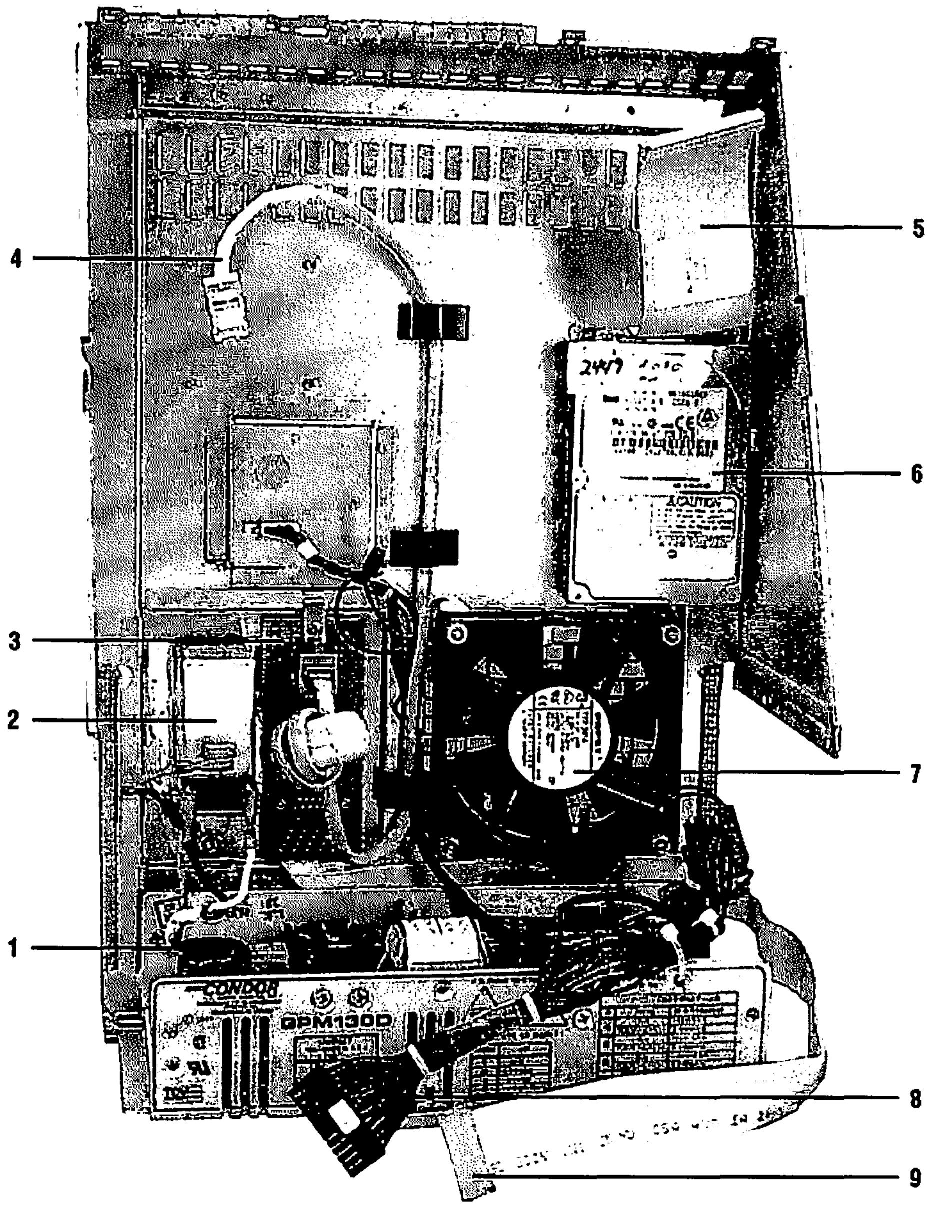
Cartridge Interface Assembly Parts List

Item	Description	Manufacturing Part	Service Part
2	Connector Block Assembly	100110	122524
4	Cam Shaft	100233	
5	Nut, KEPS 4-40 SCP	823737001	
6	Handle, Cartridge	105412	122523
7	Gear, Pinion	100186	
8	Plunger, Ball, Nylon	114302	
9	Frame, Cartridge Interface	100171	
12	Motor, Peri-pump	570223	122549 (kit)
13	Roller Cage	100552	122554
14	Mount, Motor	570546	122549 (kit)
15	Plate, Spring	570547	
16	Housing, Pump	100146	122546
17	Spring, Peri-pump	570320	122567
20	Probe, Motor	109678	
21	Actuator	100135	
23	Screw Thread-forming 8-18	104336	
25	Screw Thread-forming 4-24	823693003	
26	Screw, Sems 4-40 x 1/4	823810023	
27	Washer, Flat #4	823343003	
28	Ring, Retaining, External	823164001	
31	Spring, Return	105932	
34	Cable, Preamp Module	570269	
37	Clip, Frame	106073	
38	Grounding Strap, Interface frame	106090	
41	Cover, Preamp Cable Connector	109330	
43	Gasket, EMI	855015001	
44	Cover, Thermal	100185	122528

When ordering a kit, all items with the same RSL part number are included in the kit.

Power Module Assembly Illustrations

Power Module Assembly (Rapidpoint 400 System)

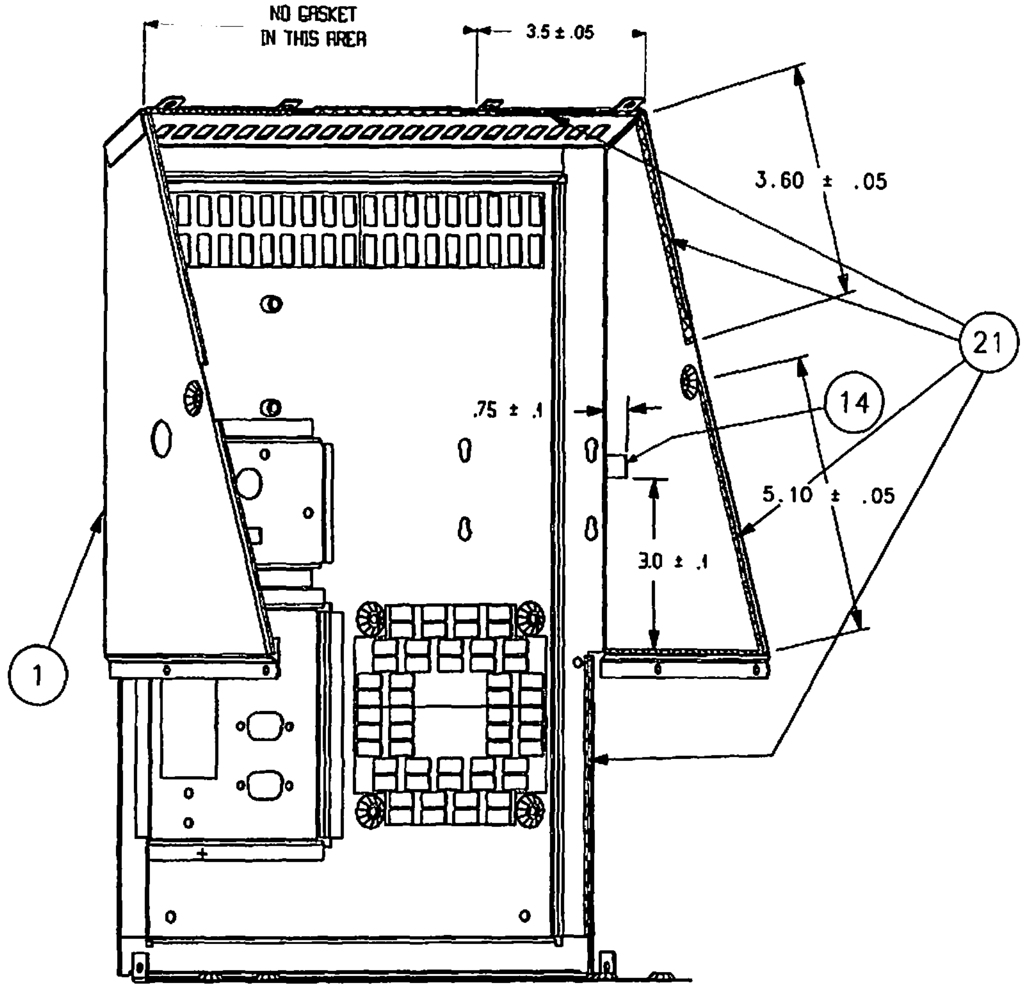


1 Power supply
2 Power entry with switch
3 Rear interconnect board
4 Patch cord
5 Hard drive cable
6 Hard drive
7 Fan
8 DC power harness
9 Rear interconnect cable

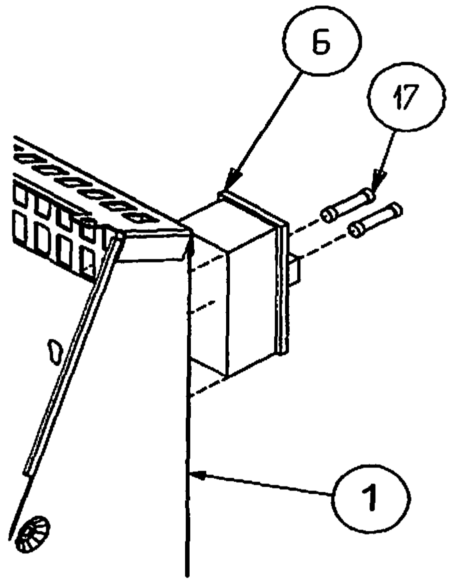
Power Module Assembly (Rapidpoint 405 System)

1 Neon board assembly
2 Fiber bundle assembly
3 Illumination housing assembly
4 Fiber bundle assembly

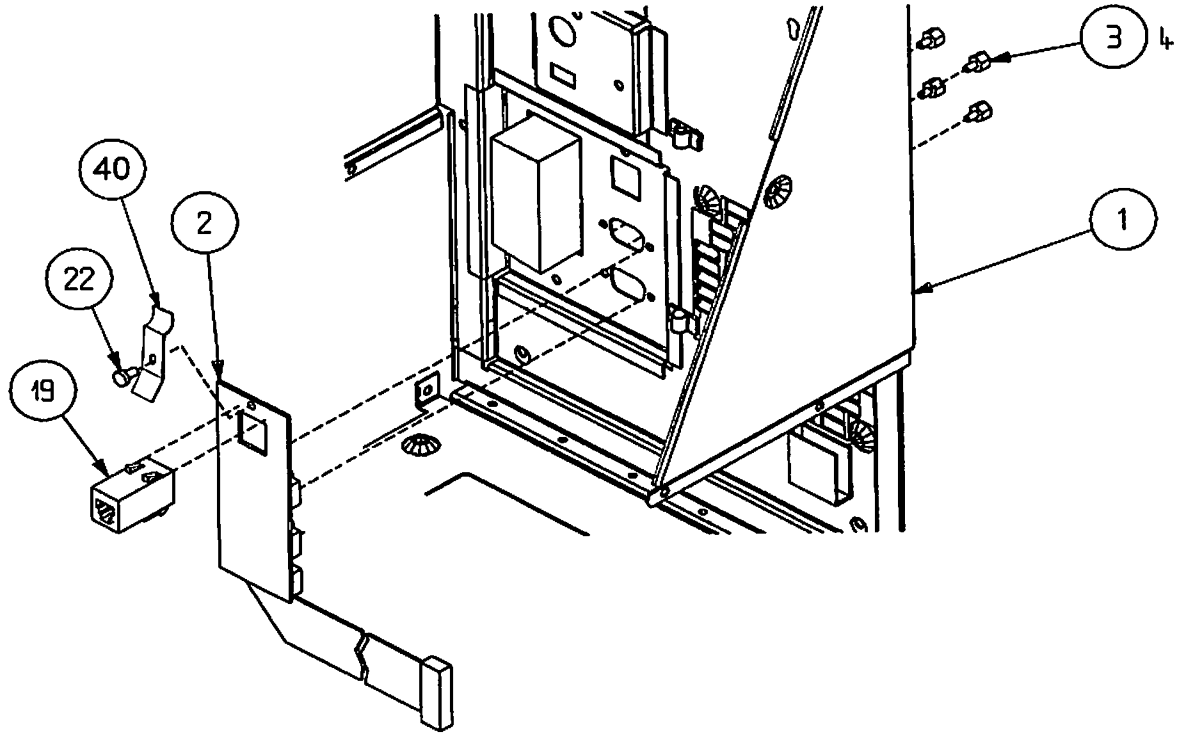
Power Module Frame



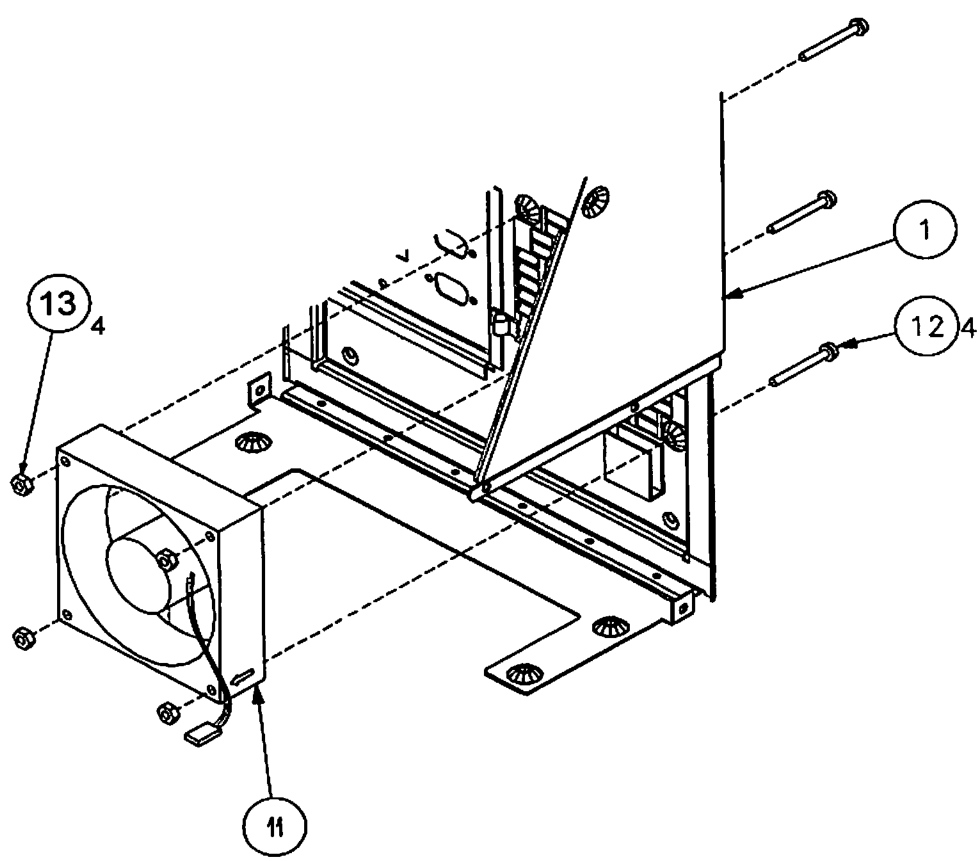
Power Entry with Switch



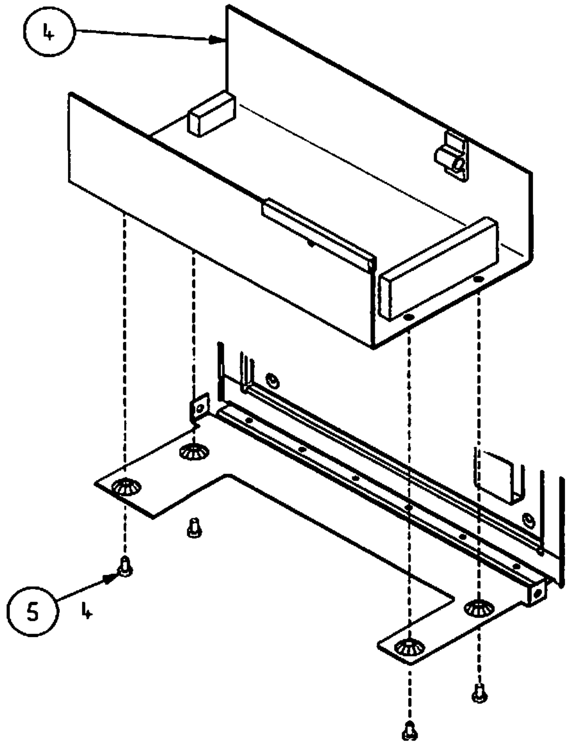
Rear Interconnect Board



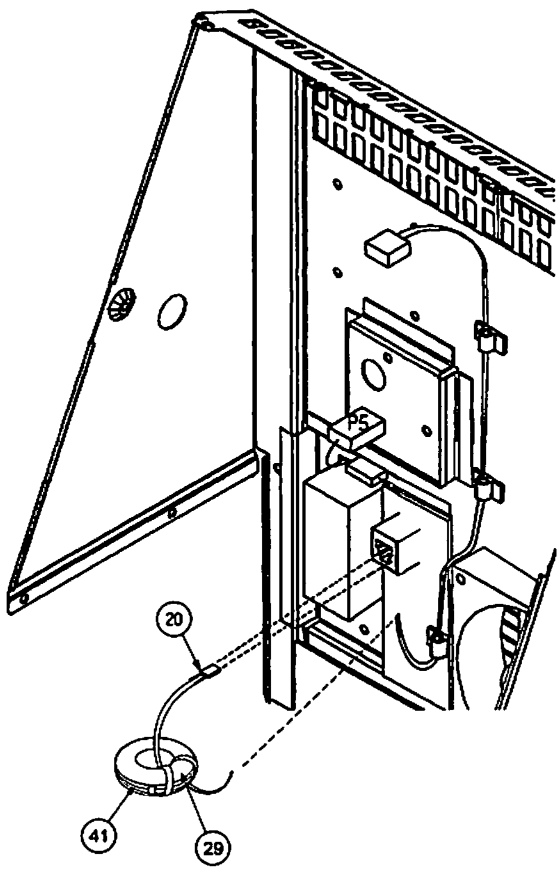
Fan



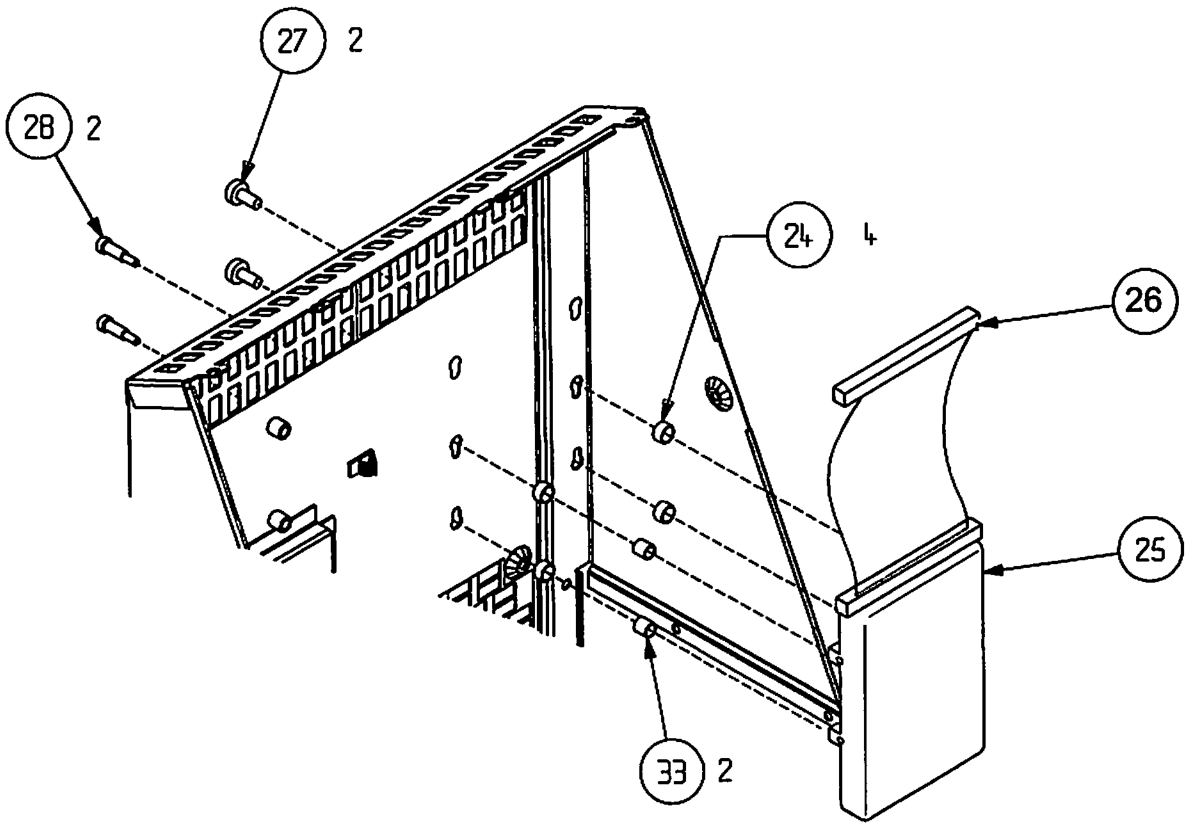
Power Supply



Patch Cord with Ferrite Filter



Hard Drive

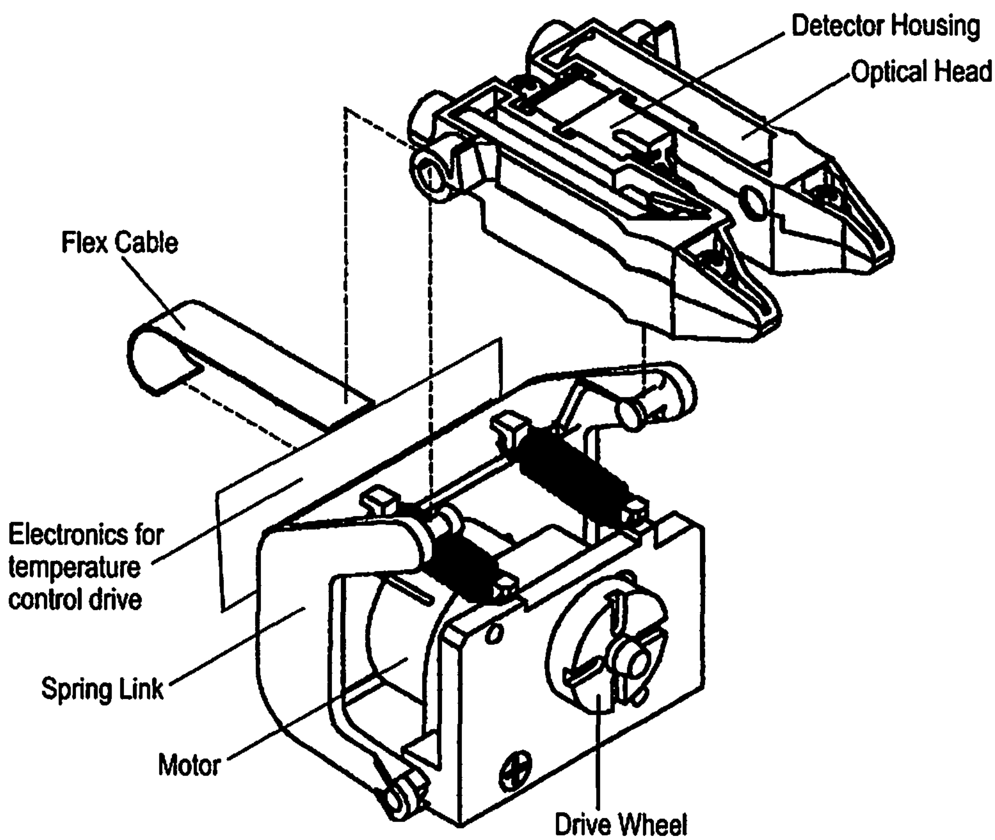


Power Module Assembly Parts List

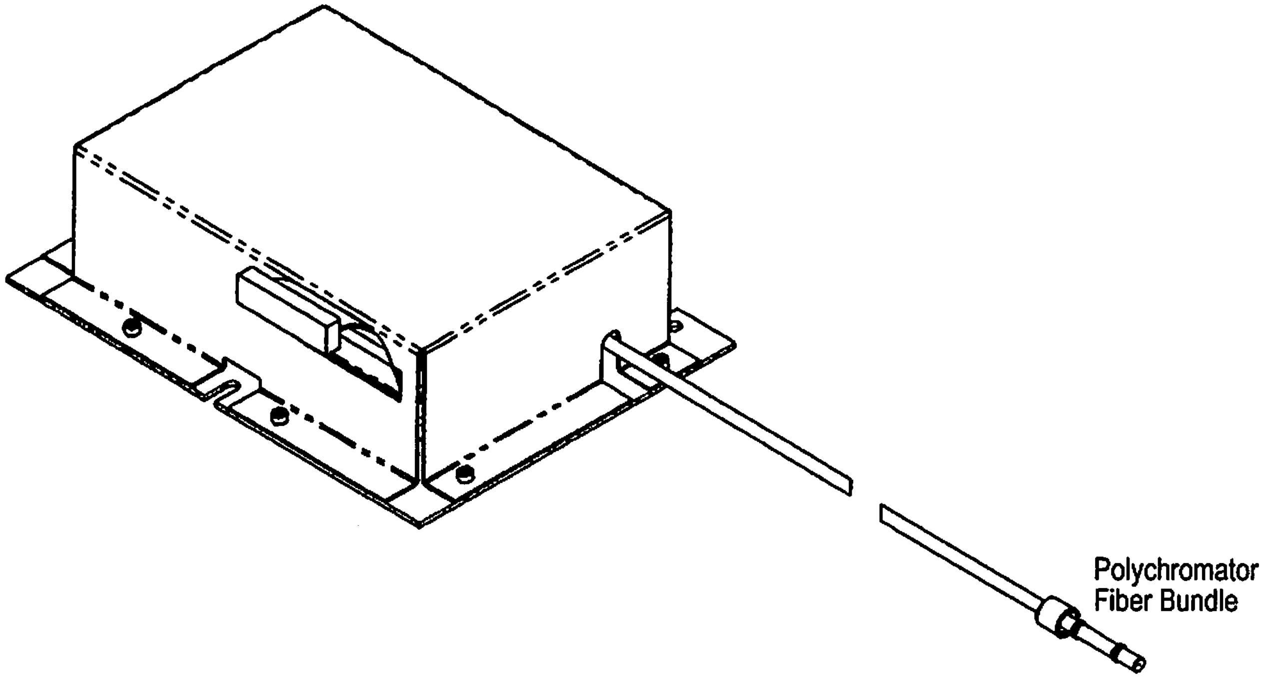
Item	Description	Manufacturing Part	Service Part
	Power Module Assembly		122560
	CO-ox Neon Board Assembly		131526
	CO-ox Illumination Housing Assembly		131529
1	Frame, Power Module	100064	
2	PCB, Rear Interconnect	102456	126786
3	Standoff, HEX 4-40 X 3/16 Long	823081026	
4	Power Supply 130W CONT 165W PK	570241	122552
5	Screw 6-32 X 1/4 Long	823810043	
6	Module, Power Entry with Switch	100376	122547
11	Fan, Cooling	100053	122533
12	Screw, Phillips, Pan-head 6-32 X 1/4	823810205	
13	Nut, KEP 6-32 SCP	823737005	
14	Strip, Contact	101802	
17	Fuse, 5 X 20 MM	105836	
19	Coupler, Modular In-line	105886	
20	Cord, Patch	119114	126793
21	Gasket, EMI	855015001	
22	Screw, SEMS 4-40 X 1/4	823810023	
24	Grommet	106036	
25	Hard Drive, Programmed (RP400)	106446	122535
25	Hard Drive, Programmed (RP405)	132134	04020470
26	Cable, Hard Drive	570257	126789
27	Screw, Shoulder	109090	
28	Screw, Shoulder, Metric	109256	
29	Filter, Ferrite 1770HM	116534	
33	Spacer, Nylon	109433	
40	Clip, EMI	122155	
41	Ty-wrap	117457	

CO-ox Module Components Illustrations

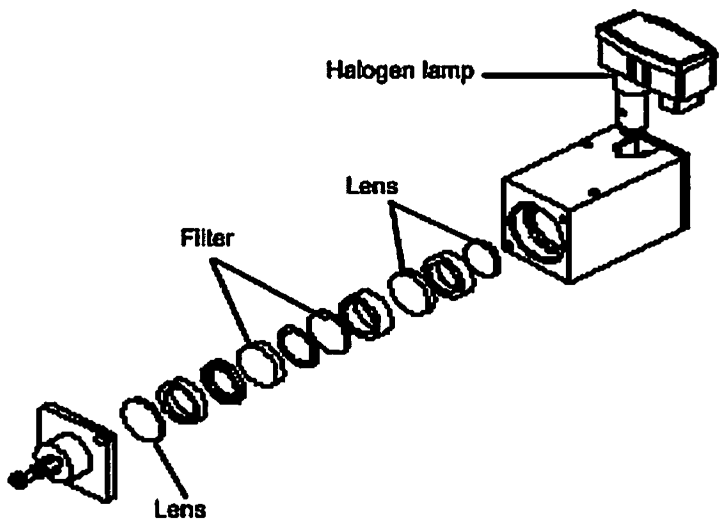
Sample Chamber Interface Assembly - RSL Part 131530



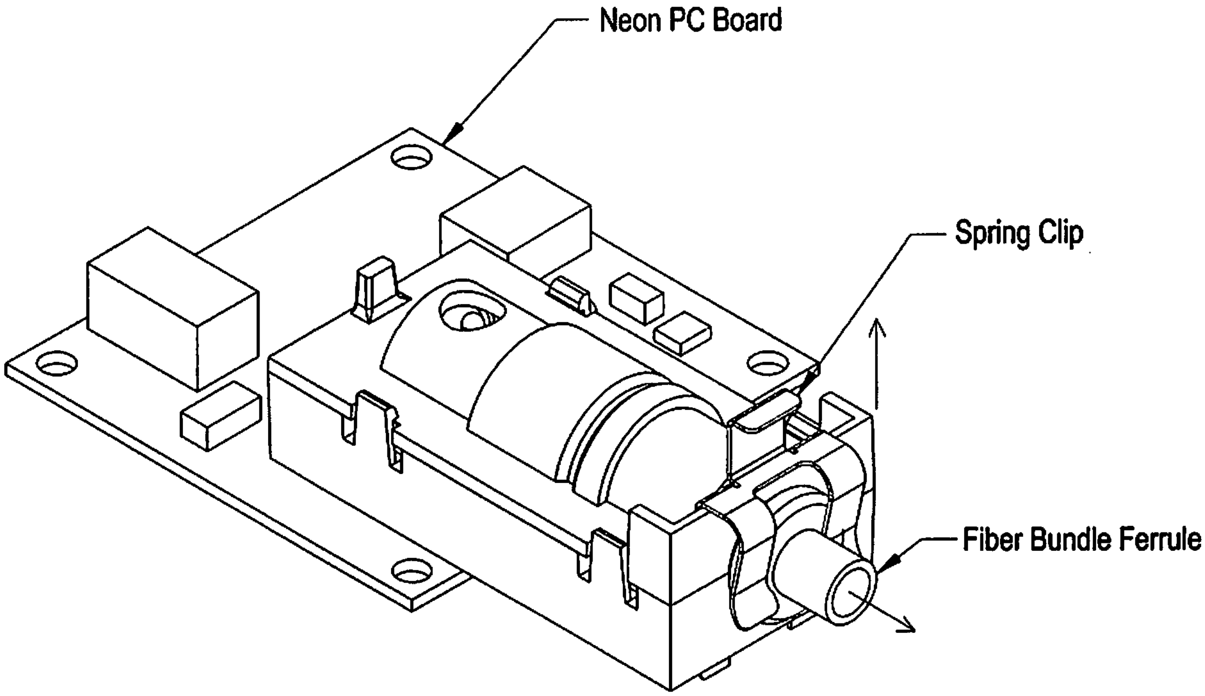
Polychromator Module Assembly - Part Number 130594



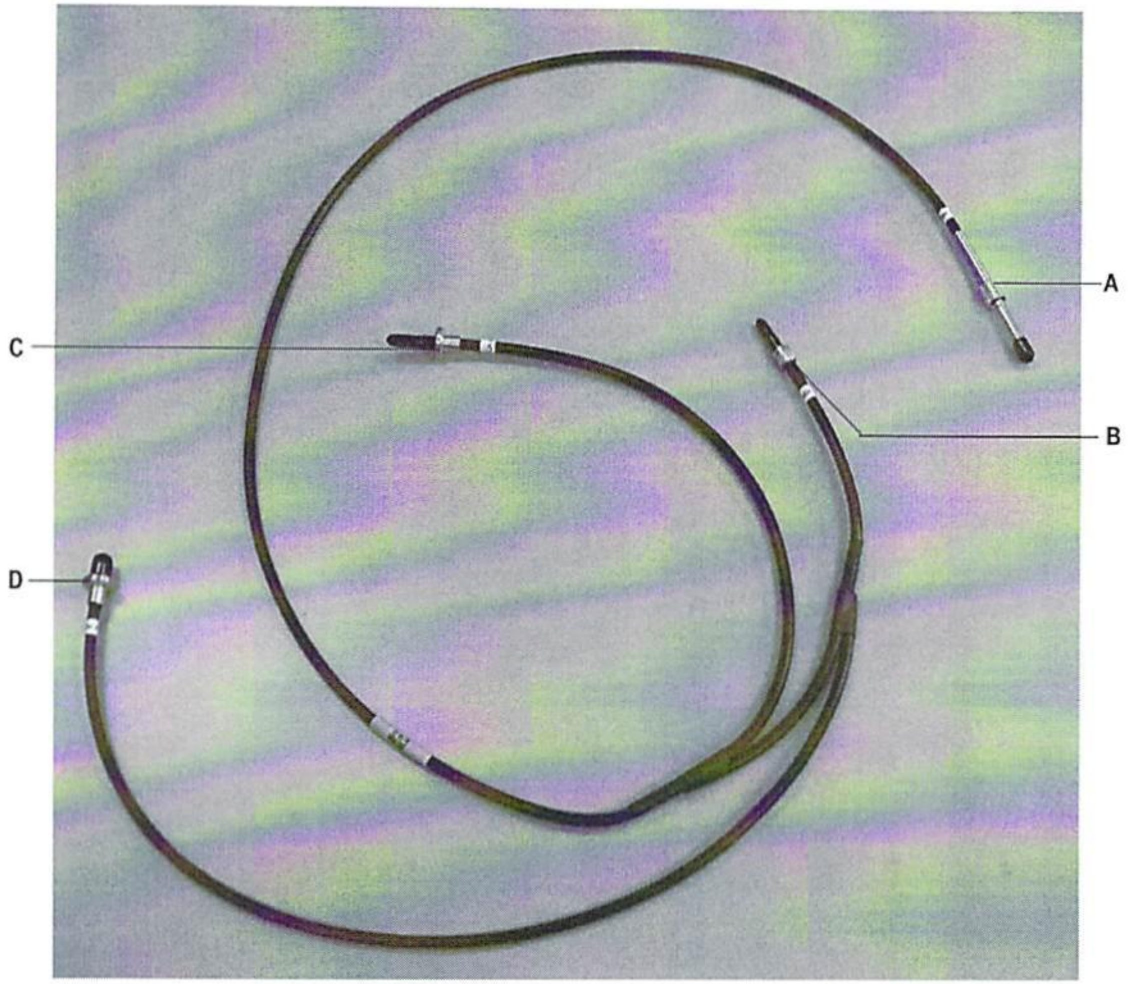
Illumination Housing Assembly - Part Number 131529



Neon Board Assembly - Part Number 131526



Fiber Bundle Assembly - Part Number 130527



A Terminal A, connects to the sample chamber interface

B Terminal B, connects to the illumination housing assembly

C Terminal C, connects to the neon board assembly

D Terminal D, connects to U3 on the main PC board

Replacing Components

Replacing the Sample Port

Use this procedure to replace the sample port. Replace the sample port if you detect a problem, or if the system prompts you as a result of the following conditions:

- no sample device inserted during analysis
- obstructions such as fibrin clots
- bubbles in the sample
- insufficient sample volume
- sample not detected
- problems with reagent flow

Material:

- sample port

BIOHAZARD: Refer to *Protecting Yourself from Biohazards*, for recommended precautions when working with biohazardous materials.

NOTE: If the system prompts you, go to step 3 in the following procedure.

1. At the Analysis screen, touch the **Status** button.
2. At the Status screen, touch **Replace Port.**
3. When prompted, replace the sample port. Refer to Figure 4-1.

NOTE: Touch the Video button to view a demonstration that shows how to perform this procedure.

   a. Squeeze the tabs on the sample port and remove it from the system.

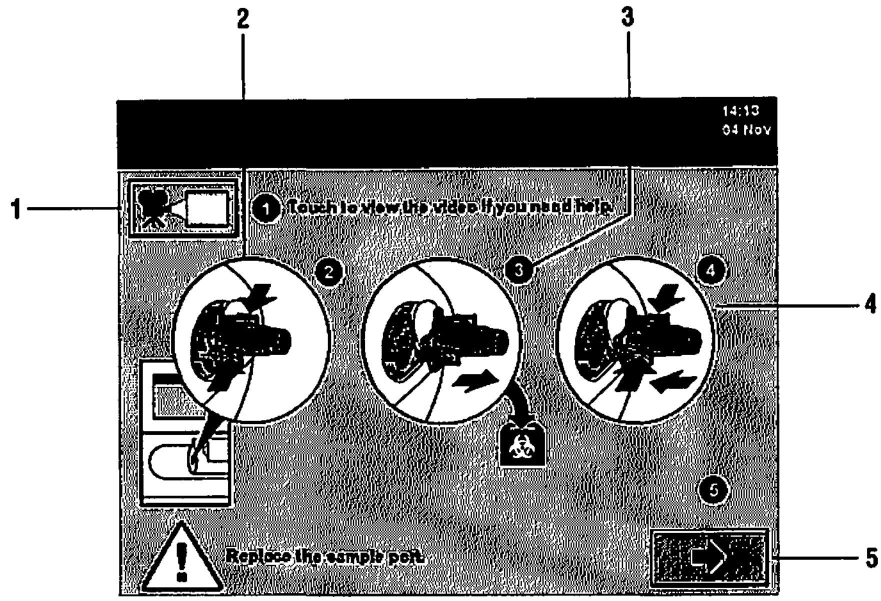
      Dispose of the sample port according to your institution's protocol for disposal of biohazardous materials.

   b. Squeeze the tabs on the new sample port.

   c. Insert the sample port on the system and release the tabs.

d. Wiggle the sample port from side to side to ensure it is attached correctly.

Replacing the Sample Port



1 Touch to view the video.

2 Squeeze the tabs firmly.

3 Remove the sample port from the system.

4 Squeeze the tabs on the new sample port and install the sample port in the system.

5 Touch the **Continue** button when you finish installing the sample port.

4. Touch the **Continue** button after replacing the sample port.

   The system performs a wash to clear the system.

⚠ **CAUTION:** Do not put the same sample port onto the system because if a clot or fluid is still present a system failure occurs invalidating the measurement cartridge.

5. Complete the necessary task:

If . . .	Then . . .
the system prompts you again to replace the sample port	repeat this procedure from step 3.
the system returns to the Analysis screen	resume operating tasks.
the system displays the Status screen and prompts you to replace the cartridges	replace the measurement and wash/waste cartridges as described in *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.*

Replacing the Fuses

Replace both fuses if one or both of the fuses are blown. If the system has power, the fuses are not blown. If the system has no power, verify the following before replacing the fuses:

- The power switch on the rear panel is turned on.
- The power cord is firmly connected to the system and to the electrical outlet.
- The electrical outlet is working.

Tools Required

- small flat-blade screwdriver

Materials

- two fuses of the appropriate rating

The Rapidpoint 400 series system uses the following fuses for the voltages shown:

Voltage	Fuse Rating	Fuse Type
100-240V	1.25A Slo Blo	5 x 20 mm

To prevent electrical shock or damage to the system, ensure that you turn the system off and disconnect the power cord before you replace the fuses.

CAUTION: Cartridges installed in the system remain stable for 60 minutes without power. To maintain cartridge stability, do not remove power from the system for more than 60 minutes if a cartridge is installed.

1. Turn off the power switch and disconnect the power cord from the electrical outlet.
2. Disconnect the power cord from the rear panel of the system.
3. Locate the fuse holder on the rear panel of the system.
4. Open the fuse holder:
   a. Pry open the fuse holder by placing a small flat-head screwdriver under the holder.

b. Pull the fuse holder out from the compartment as far as possible.

c. Push the fuse holder down to access the fuses.

5. Remove the old fuses and install new fuses.
6. Slide the fuse holder into the fuse compartment.
7. Reconnect the power cord to the system.
8. Reconnect the power cord to the electrical outlet and turn the power switch on.

   After the Rapidpoint 400 series system title screen appears, the Wait screen displays the time remaining until you can use the system. The Analysis screen appears when the system is ready to analyze samples.

Replacing the CO-ox Lamp

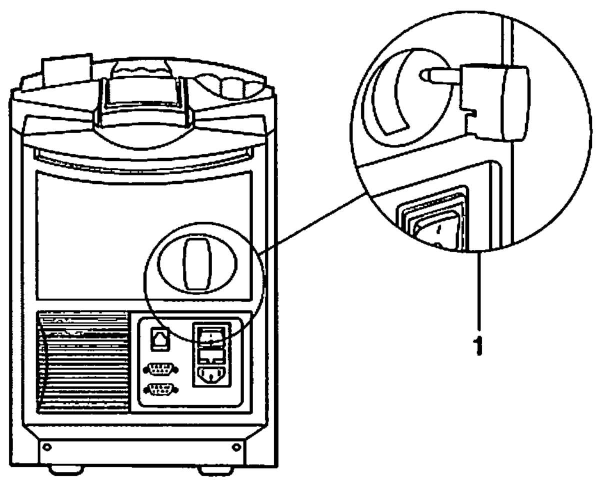
WARNING Ensure that the lamp has been off for at least 5 minutes to allow sufficient time for it to cool.

Materials:

- CO-ox lamp

1. Turn off the power switch and disconnect the power cord from the electrical outlet.
2. Disconnect the power cord from the rear panel of the system.
3. Locate the lamp on the rear panel of the system. Refer to the following figure.

Replacing the CO-ox Lamp



4. Remove the old lamp and discard it.

⚠ **CAUTION:** Avoid touching the lamp with your fingers. Touching the glass may cause the lamp to deteriorate prematurely.

5. Install a new one.
6. Reconnect the power cord to the system.
7. Reconnect the power cord to the electrical outlet and turn the power switch on.

   After the Rapidpoint 400 series system title screen appears, the Wait screen displays the time remaining until you can use the system. The Analysis screen appears when the system is ready to analyze samples.

Replacing the Cartridge Interface Assembly

BIOHAZARD: Refer to *Biohazards and Warnings.*

WARNING Electrical shock hazard. Refer to *Biohazards and Warnings.*

CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

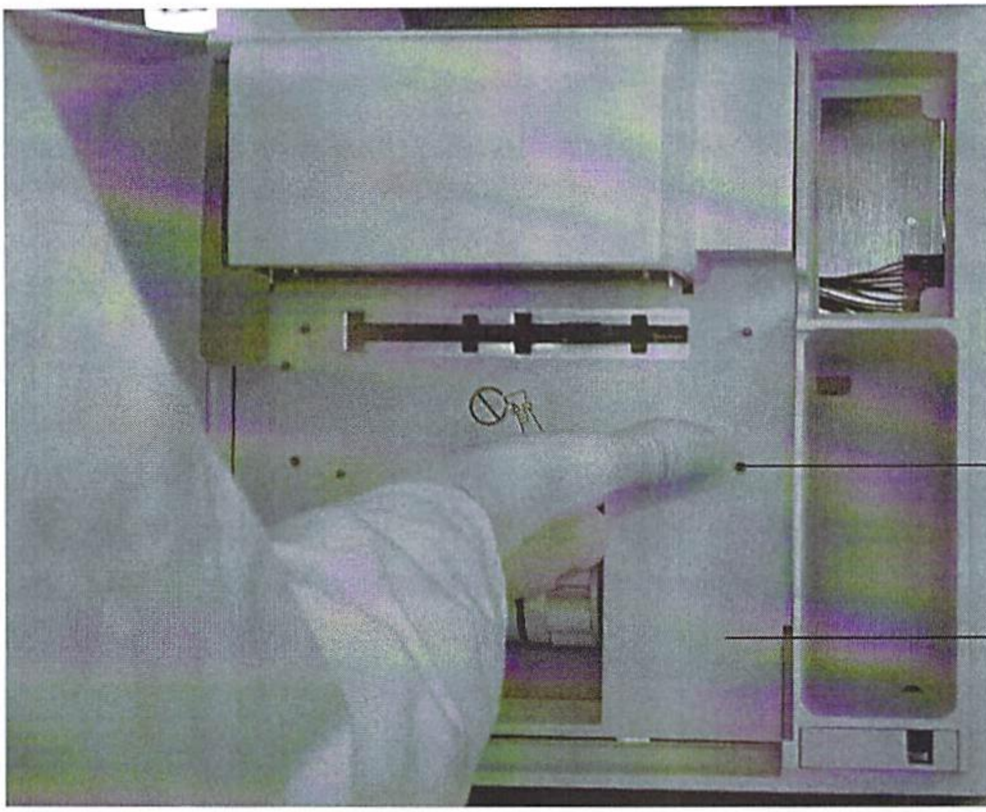
Tools and Supplies

- Phillips screwdriver, #1
- small flat-blade screwdriver

NOTE: Add the label and plug to the front of the cartridge interface assembly before you begin. See the instructions in the kit.

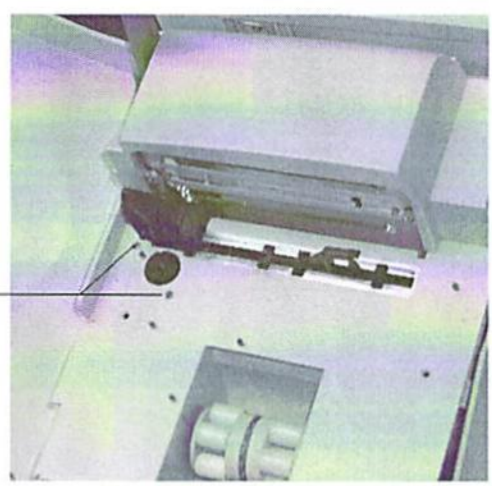
1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the rear cover. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.
3. Open the door:
   a. Slide the front of the system to the edge of the work surface.
   b. Using a small flat-blade screwdriver, access the door lock solenoid through the middle of the three access holes in the bottom front right corner of the system and push the solenoid toward the back of the system until the front door opens.
4. Remove the cartridge interface assembly:

a. Using a small Phillips screwdriver, remove the two flat-head screws in the front of the cartridge interface assembly.



CAUTION: Do not touch the sensor contact area.

405 b. Remove the two screws from the front of the cartridge interface assembly securing the sample chamber interface assembly.



c. While slowly tilting the top of the cartridge interface assembly up and forward, ease the lower of the two ribbon cables (the one that connects at the side of the system) through the cartridge interface wall.

d. Remove the three screws securing the preamp cable cover and remove the cover.

e. Disconnect the preamp cable from the connector block by squeezing the ends of the connector and pulling up and then push it through the horizontal slot in the cartridge interface wall.

1 Preamp cable

2 Outboard cable harness connector (25 pin male)

3 Outboard cable harness connector (25 pin female)

405 f. Disconnect the harness OMZ (5 pin) from J2 on the OMZ PCB on the sample chamber interface assembly. This harness is also connected to the connector block assembly.

g. Pull the cartridge interface assembly further away from the system and disconnect the outboard cable harness connector (25 pin male) (P20) from the rear of the base.

h. Disconnect the wash/waste switch harness (2 pin plug) (P61) and the door lock assembly cable (4 pin plug) (P60).

i. Disconnect the outboard cable harness connector (25 pin female) (J30) from the rear of the base.

405 j. Disconnect the CO-ox cable (P50), and then remove the cable from the cable clamp.

NOTE: This cable is not connected when the CO-oximeter is not present.

k. Remove the AQC cable (P40) from the cable clamp and disconnect the AQC connector.

l. Remove the cartridge interface assembly from the system.

5. Install the new cartridge interface assembly.
6. Reassemble in the reverse order. Refer to *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378.

Replacing the Connector Block Assembly

BIOHAZARD: Refer to *Biohazards and Warnings.*

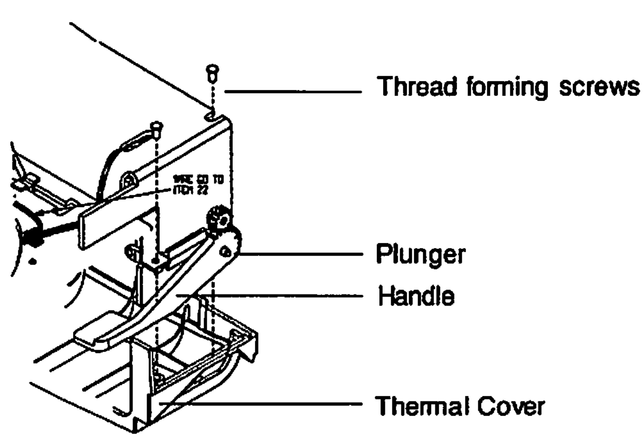
WARNING Electrical shock hazard. Refer to *Biohazards and Warnings.*

CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

Tools and Supplies

- Phillips screwdriver, #1
- small flat-blade screwdriver
- cutters
- Allen wrench, 5/64
- needle-nose pliers
- pin extractor

1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the rear cover. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.
3. Remove the cartridge interface assembly. Refer to *Replacing the Cartridge Interface Assembly* on page 309.
4. Remove the four thread-forming screws securing the thermal cover.
5. Lift the handle.



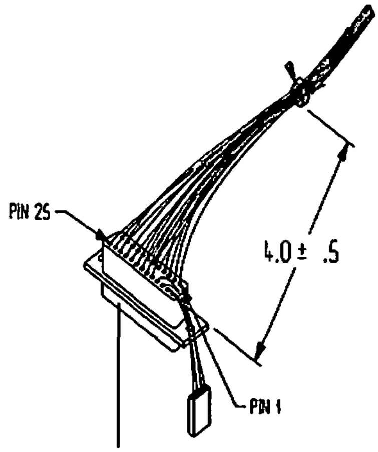
6. Ease the thermal cover over the plunger.

   a. Rotate the thermal cover 90° and slide it forward over the handle.

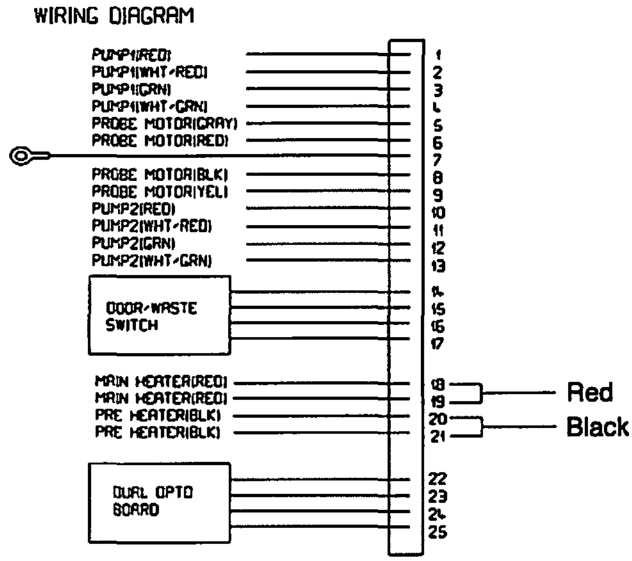
⚠ **CAUTION:** Do not remove the connector block cover. The connector block cover is part of the connector block assembly.

NOTE: Newer models of the cartridge interface assembly have in-line connectors and do not require using the pin extractor.

7. Using the pin extractor, twist and remove wires 18, 19, 20, and 21 from the outboard cable harness connector.

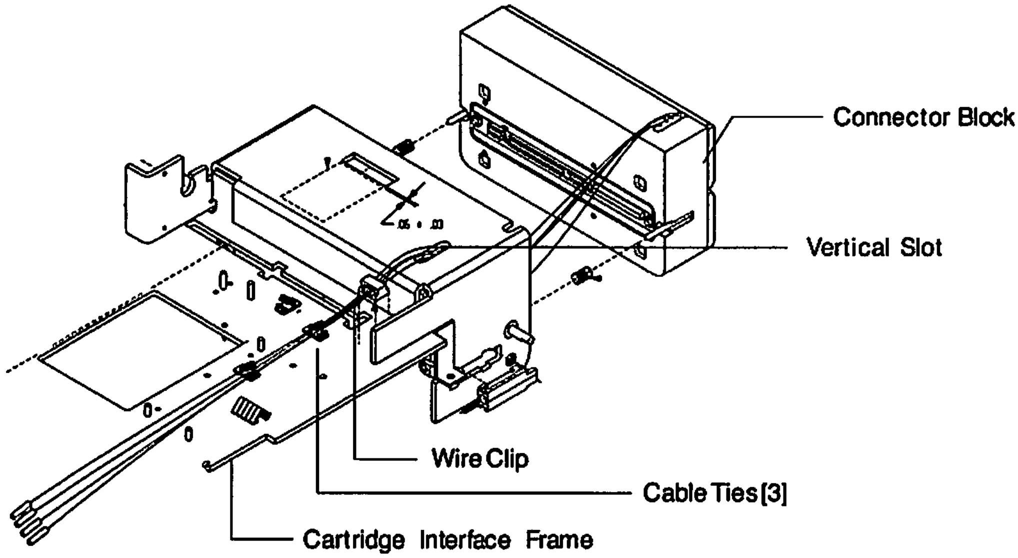


Outboard Cable Harness



8. Remove the cables from the cable clamps.

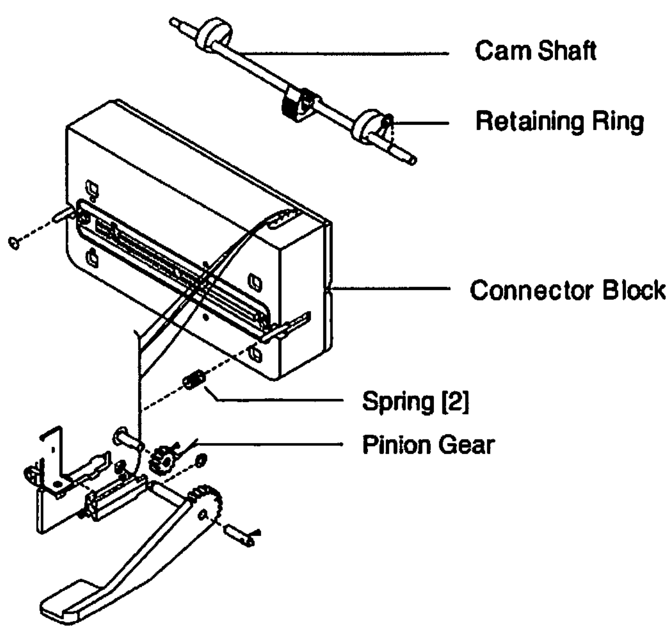
9. Cut the cable ties holding the preheater, the main heater, and the block connector wires, which run along the rear of the cartridge interface frame.



10. Remove the cam shaft:

    a. Using the flat-blade screwdriver, remove the pinion gear from the end of the cam shaft.

    b. Using either a flat-blade screwdriver or needle-nose pliers, remove the retaining ring (C-clip) from the cam shaft.



c. Slide the cam shaft to the left and pull the cam shaft out of the cartridge interface frame.

   Ensure that the springs are retained at the bottom of the block.

11. Pull the preheater, the main heater, and the connector block wires through the vertical slot in the cartridge block cover

12. Remove the connector block from the cartridge interface assembly by lifting the connector block off the springs and sliding the connector block towards you.

⚠ **CAUTION:** When lifting the connector block, retain the two springs located on the alignment pins.

13. Lay the cartridge interface assembly with the motor side facing down

14. Install the new connector block:

    a. Route all the wires through the cartridge interface frame.

    b. Slide the springs onto the alignment pins. Mount the connector block by sliding the block alignment pins through the holes in the cartridge interface frame.

    c. Reinstall the camshaft.

⚠ **CAUTION:** Align the timing marks on the teeth of the cartridge handle with those of the pinion gear. If misaligned, the cartridge will not function correctly.

NOTE: The position of the gears is indicated with pin holes and must be aligned correctly.

    d. Reinstall the pinion gear without engaging the teeth of the cartridge handle.

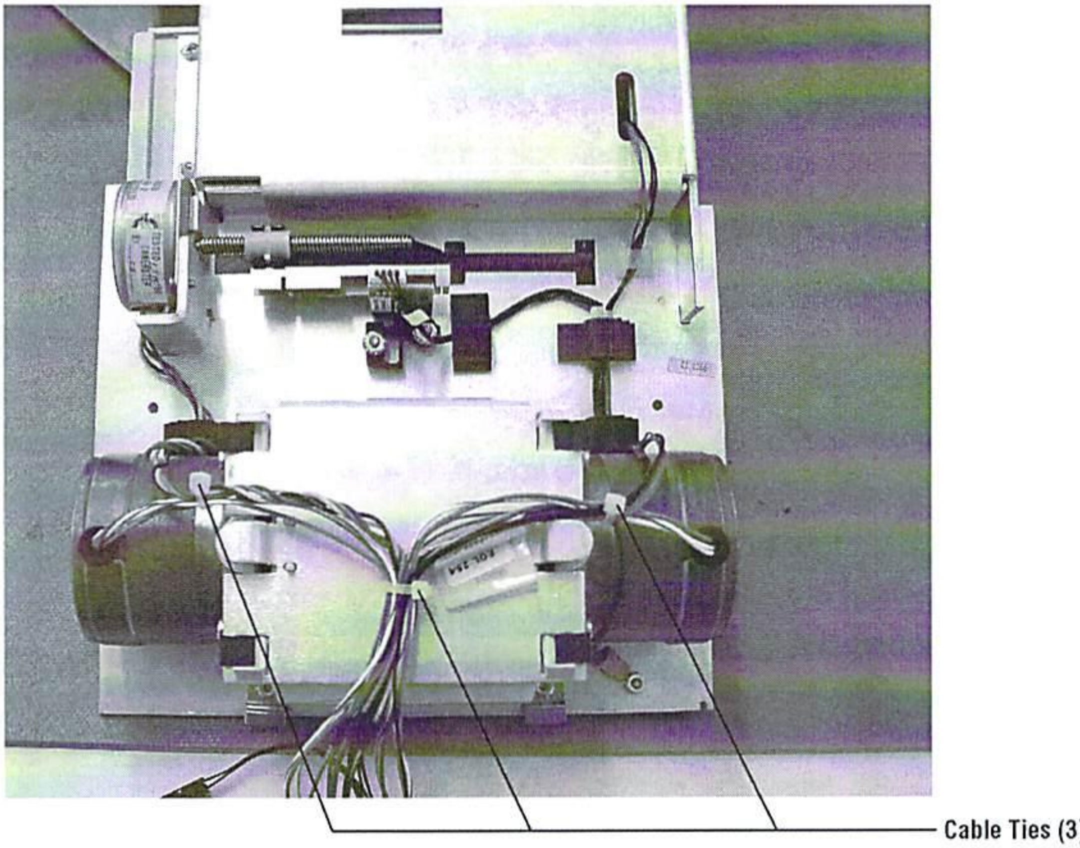
    e. Align the timing marks on the teeth of the cartridge handle with those of the pinion gear.

    f. Reinstall the retaining ring.

    g. Reinstall the thermal cover.

⚠ **CAUTION:** Correctly connect the wires or temperature errors will occur.

h. Reinstall the two red wires to positions 18 and 19 and the two black wires to positions 20 and 21 in the outboard cable harness connector, and secure with a cable tie.



15. Reinstall the cartridge interface assembly. Refer to *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378.

Removing the AutomaticQC Cartridge

Use this procedure to remove the AutomaticQC cartridge from the system when the system has no power and the cartridge is still installed.

BIOHAZARD: Refer to *Biohazards and Warnings*.

WARNING Electrical shock hazard. Refer to *Biohazards and Warnings*.

CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

Tools and Supplies

- Phillips screwdriver, #1
- long flat-blade screwdriver

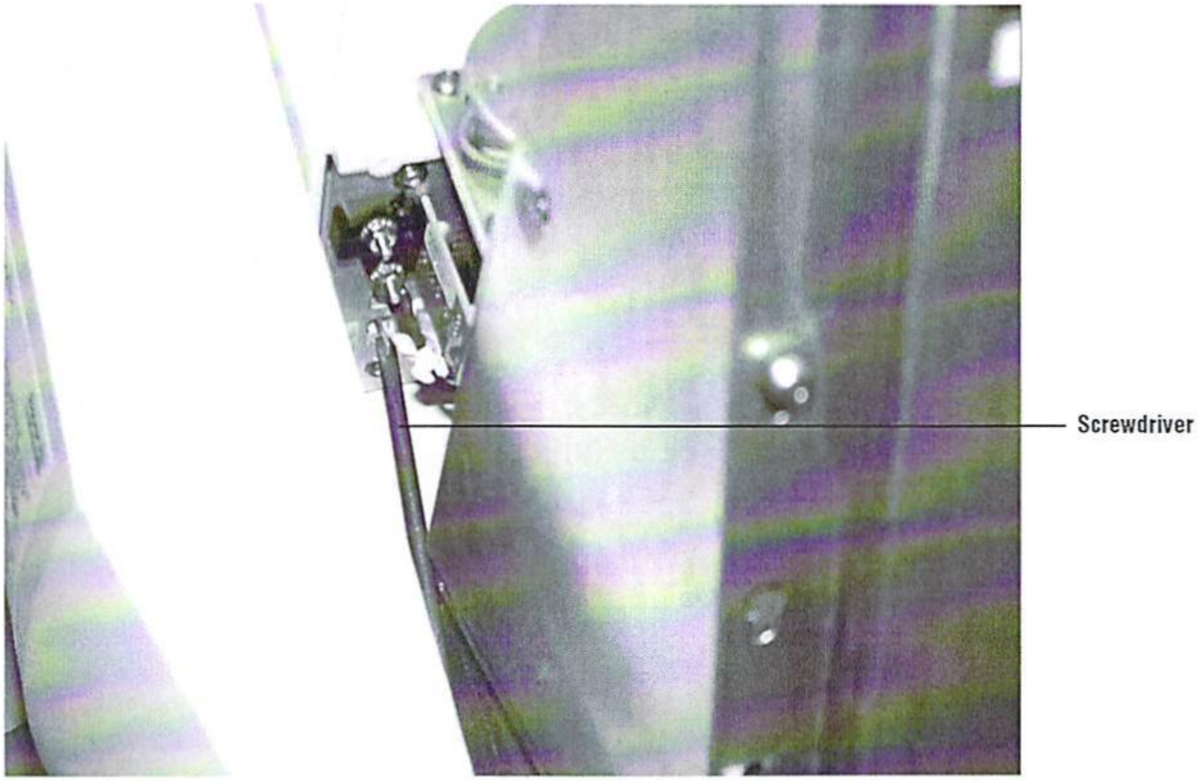
1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the halogen lamp.
3. Remove the rear cover.
   a. Using the Phillips screwdriver, remove four screws: one screw on each side and two screws on the rear of the cover.

NOTE: Position the instrument handle in the up position. Using a flat-head screwdriver pry the cover and the side, without the AutomaticQC cartridge, away from the system. Gradually work the cover until it slides over the handle. Do not catch the two barbed tabs located at the sides of the system base.

   b. Slide the rear cover up and off the system.

4. Remove the AutomaticQC cartridge:
   a. Open the cartridge connector on the front of the AutomaticQC cartridge.

b. Insert the long flat-blade screwdriver between the cartridge and the side of the system and lift the tab to release the cartridge.



NOTE: If the cartridge does not release from the system, push the cartridge into the system to fully engage the anchors on the cartridge and lift the tab again.

c. Pull the cartridge from the system.

Replacing the AutomaticQC Frame Assembly

BIOHAZARD: Refer to *Biohazards and Warnings.*

WARNING Electrical shock hazard. Refer to *Biohazards and Warnings.*

CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

Tools and Supplies

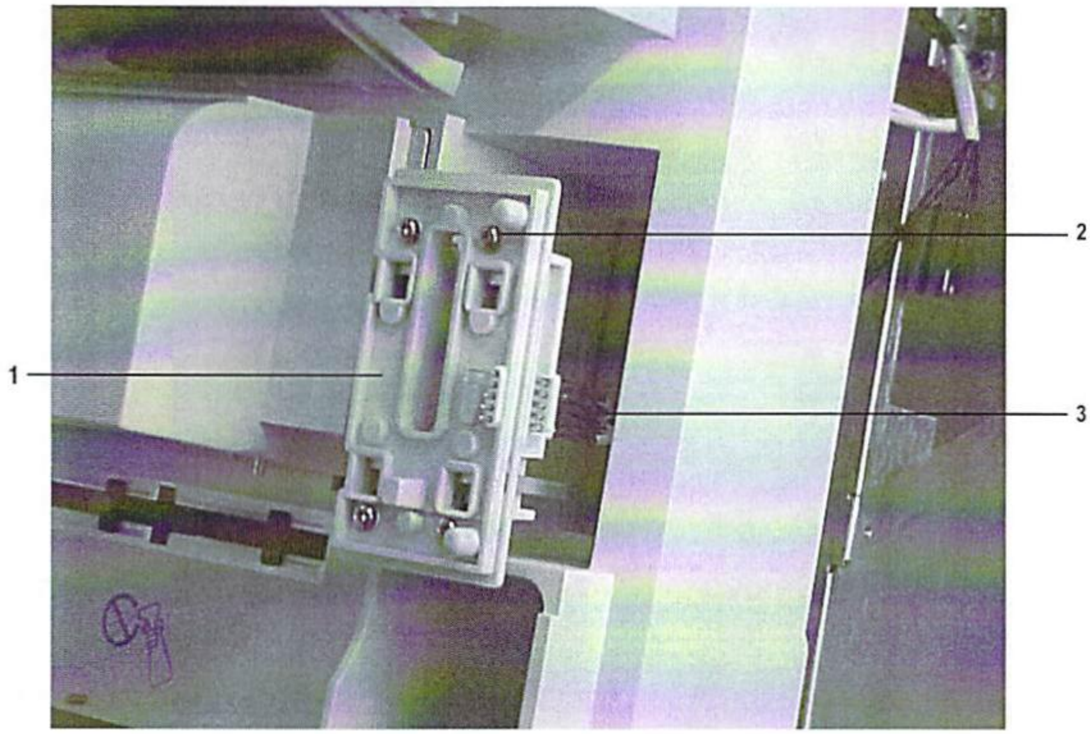
- Phillips screwdriver, #1

1. Before disconnecting power, remove the AutomaticQC cartridge. Refer to Section 3 in the *Rapidpoint 400 Series Operator's Manual.*

NOTE: If the system does not have power, and the cartridge is still installed, refer to *Removing the AutomaticQC Cartridge* on page 318.

2. Turn the system off and disconnect all the external cables from the back of the system.
3. Remove the rear cover. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.
4. Remove the cartridge interface assembly. Refer to *Replacing the Cartridge Interface Assembly* on page 309.
5. Remove the AutomaticQC latch assembly:

a. Loosen the four captive screws securing the AutomaticQC latch assembly. Do not remove the screws.



1 AQC latch assembly

2 Captive screws (4)

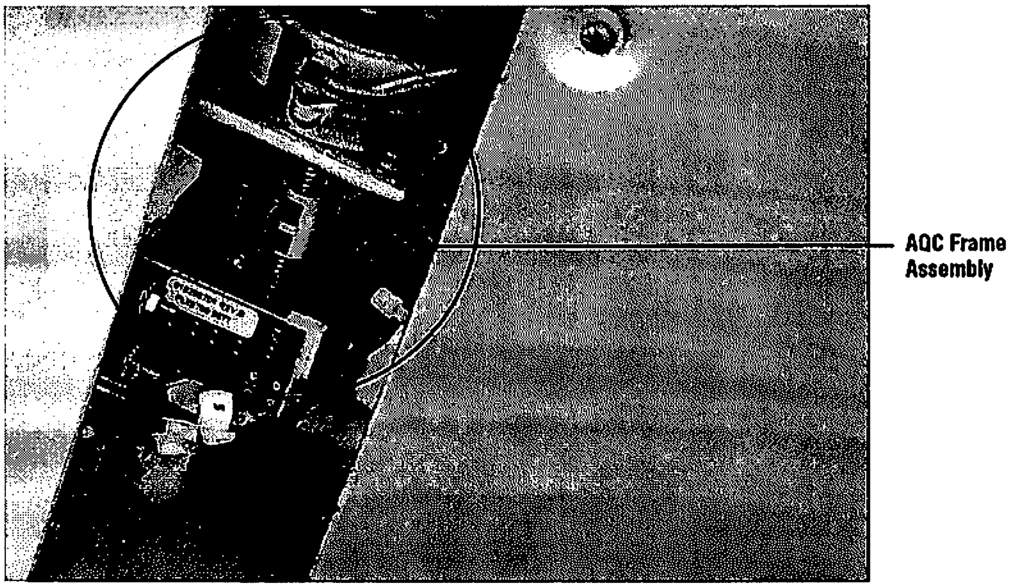
3 Cable to the AQC frame assembly

b. Remove the copper AutomaticQC clip from between the AutomaticQC frame assembly and the base wall.

c. Disconnect the cable (J43) from the AutomaticQC frame assembly.

While pulling the AutomaticQC latch assembly from the system, guide the cable connector through the slot in the wall interface.

6. Remove the AutomaticQC frame assembly:



   a. Remove the two thread-forming screws and washers from the AutomaticQC frame assembly.

   b. Pull the AutomaticQC frame assembly away from the wall interface and lift it out of the system.

   c. Disconnect the cable from the AutomaticQC frame assembly to the outboard cable harness.

7. Reinstall the AutomaticQC frame assembly and the AutomaticQC latch assembly.

8. Reinstall the cartridge interface assembly. Refer to *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378.

Replacing the Diskette Drive Assembly

BIOHAZARD: Refer to *Biohazards and Warnings.*

WARNING Electrical shock hazard. Refer to *Biohazards and Warnings.*

CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

Tools and Supplies

- Phillips screwdriver, #1

1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the rear cover and power module assembly. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.
3. Disconnect the following cables:

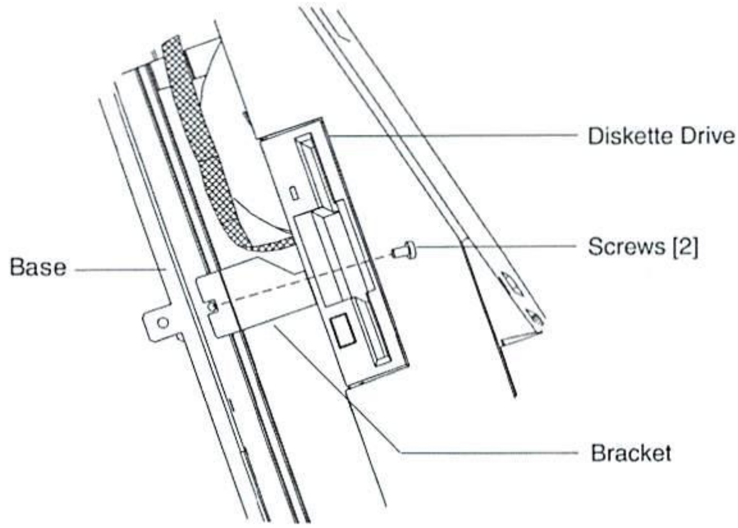
Disconnect the . . .	**From the . . .**
diskette power harness	Main board
diskette drive cable	UIP board

4. Remove the diskette drive from the interface wall:

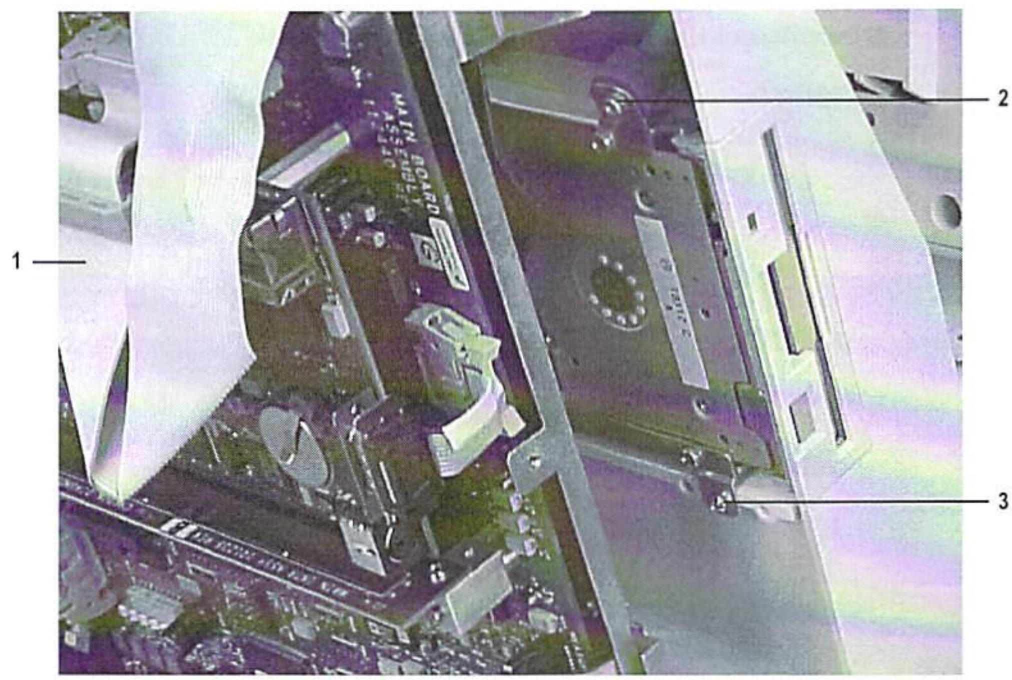
NOTE: If required, remove the spring clip on the bottom of the diskette drive bracket to access the bottom screw.

   a. Move the display screen forward.

b. Remove the 6-32 x 1/4 long screw securing the diskette drive connector clamp to the rear of the system base.



c. Remove two Phillips-head screws at the top and bottom of the diskette drive connector clamp.



1 Diskette drive cable

2 Screw at top of diskette drive connector clamp

2 Screw at bottom of diskette drive connector clamp

---

d. Remove diskette drive cable form its cable clamp.

CAUTION: Ensure cables do not catch on the RFI shielding fingers.

e. Slide diskette drive out through the slot.

⚠ **CAUTION:** When inserting the new diskette drive, the 100-pin display cable must be located beneath the diskette drive bracket or the display will not pivot correctly when adjusted.

⚠ **CAUTION:** Do not cross-thread the screws that secure the diskette drive bracket to the interface wall. The screws seat in brass inserts and cross-threading effectively welds the screws to the inserts.

5. Install the new diskette drive:

   a. Slide the diskette drive into position and replace the two screws.

   b. Reconnect the diskette power harness to the Main board.

⚠ **CAUTION:** Ensure cables do not catch on the RFI shielding fingers.

   c. Replace the diskette drive cable, reconnect the diskette drive cable in the cable clamp and to the UIP board.

   d. Ensure that the diskette drive is flush with the side of the system and adjust the screws as necessary.

6. Reassemble in the reverse order. Refer to *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378.

Replacing the Display/Printer Assembly

BIOHAZARD: Refer to *Biohazards and Warnings*.

WARNING Electrical shock hazard. Refer to *Biohazards and Warnings*.

CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

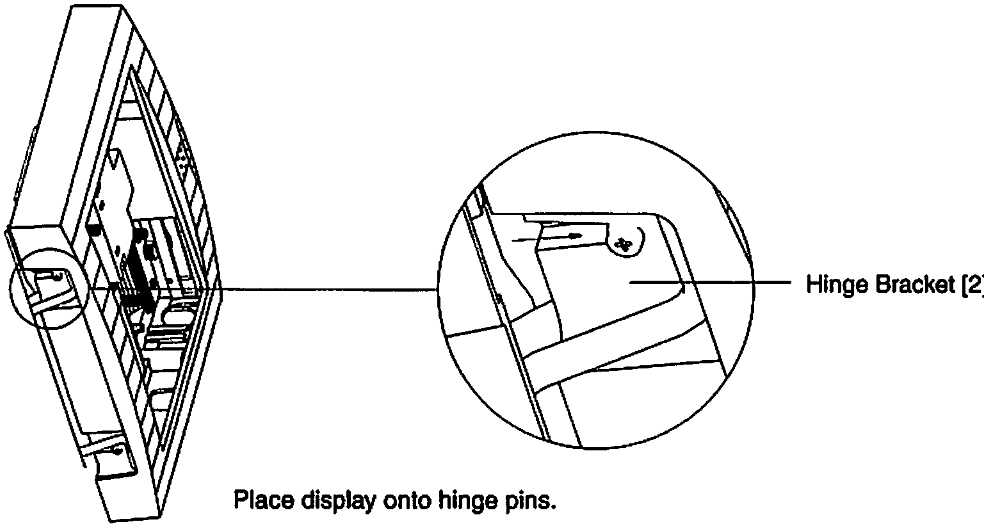
NOTE: Remove the diskette drive from the interface wall before removing the display module. Refer to *Replacing the Diskette Drive Assembly* on page 323.

Tools and Supplies

- Phillips screwdriver, #1
- small flat-blade screwdriver
- torque driver

1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the ampule breaker or Automatic QC cartridge and open the front door.
3. Remove the rear cover and power module assembly. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.
4. Remove the cartridge interface assembly. Refer to *Replacing the Cartridge Interface Assembly* on page 309.

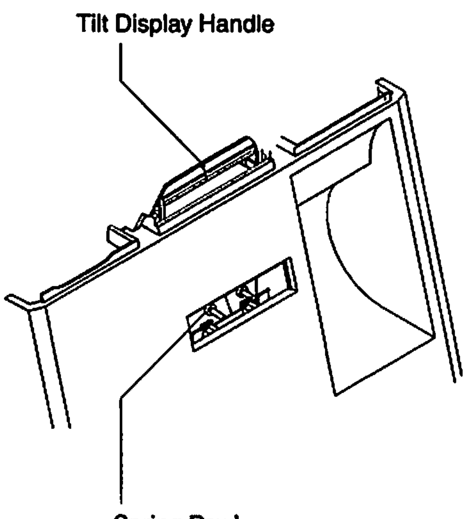
5. Loosen the two screws in the hinge brackets at the base of the display.



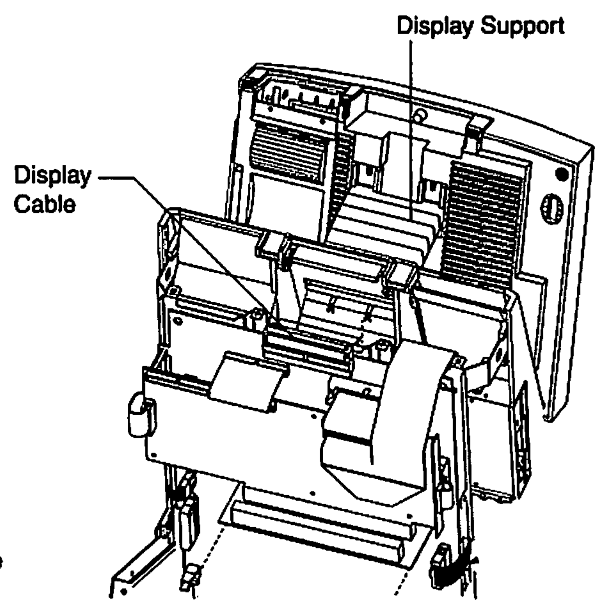
Place display onto hinge pins.

NOTE: When reassembling, secure the display by pulling the hinge bracket forward and torquing screws to 6-inch lb.

6. Remove the diskette drive. Refer to *Replacing the Diskette Drive Assembly* on page 323.
7. Using the tilt display handle, pull the display forward.
8. Disconnect the display cable from the Main board.
9. Using a flat-blade screwdriver, press the spring pawl down while pulling the display forward so that the display support slides out of the slot in the interface wall.



Press spring pawl down to release the tilt bracket.



NOTE: The display cable fits tightly in the slot.

10. Remove the plastic grommet from the display cable slot.
11. Carefully pull the display cable and display cable plug through the slot in the interface wall. Retain the cable plug.
12. Lift the display off the display pivot.
13. Install the new display module:

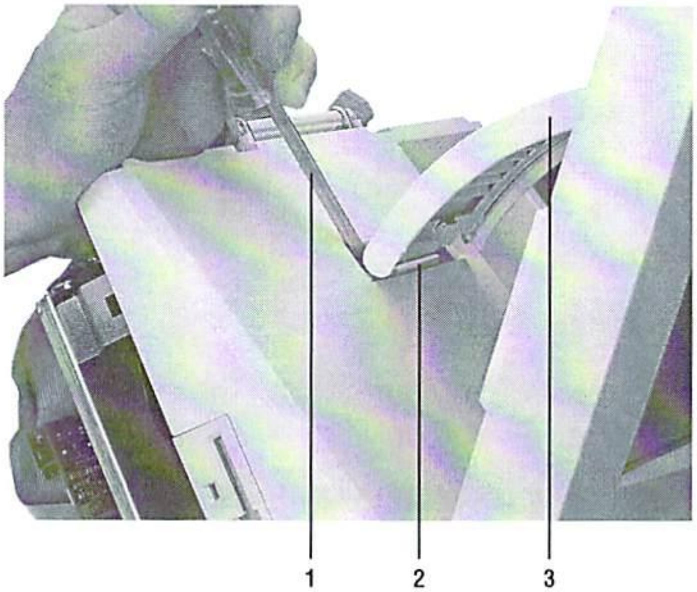
NOTE: Leave some slack in the display cable between the display and the interface wall to allow for movement of the display.

   a. Reinsert the display cable through the slot in the interface wall and reinsert the grommet.

⚠ **CAUTION:** Ensure that the spring pawl is positioned forward in the slot. If the spring pawl is incorrectly positioned when the display support is inserted, the display support will jam.

   b. Place the display module on the display pivot.

c. With the spring pawl positioned in the slot, use a flat-blade screwdriver to press the spring pawl down, toward the front of the system, and hold it down while inserting the display support through the slot until it locks into place.



1 Flat-blade screwdriver holds the spring pawl in place

2 Spring pawl down toward the front of the system

3 Display support

NOTE: If the spring pawl jams, position a screwdriver behind the spring pawl and push it forward while sliding the display support forward one tooth at a time until correctly seated.

d. Tilt the display module back completely. Locate the hinge brackets at the base of the display and pull the hinge brackets forward. Tighten the two screws located at the base of the display.

e. Reconnect the display cable to the Main board.

14. Reassemble in the reverse order. Refer to *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378.

15. Close the front door and reinstall the ampule breaker.

Replacing the Paper Cover

BIOHAZARD: Refer to *Biohazards and Warnings.*

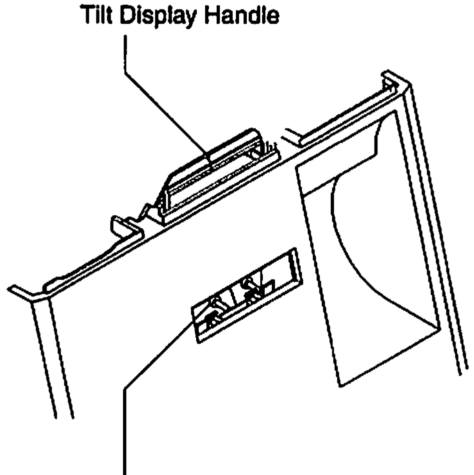
WARNING Electrical shock hazard. Refer to *Biohazards and Warnings.*

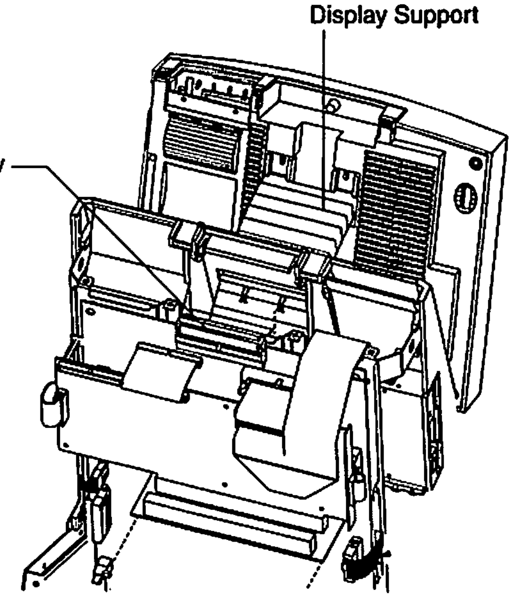
CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

Tools and Supplies

- Phillips screwdriver, #1
- small flat-blade screwdriver

1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the rear cover. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.
3. Remove the ampule breaker or AutomaticQC cartridge and open the front door.
4. Using the tilt display handle, pull the display forward.
5. Using a flat-blade screwdriver, press the spring pawl down while pulling the display forward so that the display support slides out of the slot in the interface wall.

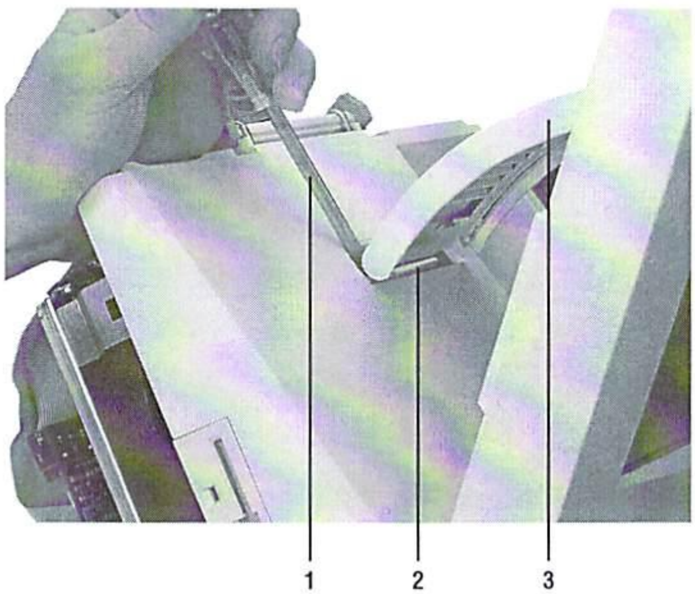




6. Carefully lower the display until the hinge for the paper cover is exposed.
7. Lift the paper cover off the hinge.
8. Install the new paper cover.
9. Reinstall the display support:

CAUTION: Ensure that the spring pawl is positioned forward in the slot. If the spring pawl is incorrectly positioned when the display support is inserted, the display support will jam.

   a. With the spring pawl positioned in the slot, use a flat-blade screwdriver to press the spring pawl down, toward the front of the system, and hold it down while inserting the display support through the slot until it locks into place.



1 Flat-blade screwdriver holds the spring pawl in place
2 Spring pawl down toward the front of the system
3 Display support

NOTE: If the spring pawl jams, position a screwdriver behind the spring pall and push it forward while sliding the display support forward one tooth at a time until correctly seated.

   b. Using the tilt display handle, move the display back and forth to test the position of the display support.

10. Replace the rear cover. Refer to *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378.

Replacing the Door Lock Module

BIOHAZARD: Refer to *Biohazards and Warnings.*

WARNING Electrical shock hazard. Refer to *Biohazards and Warnings.*

CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

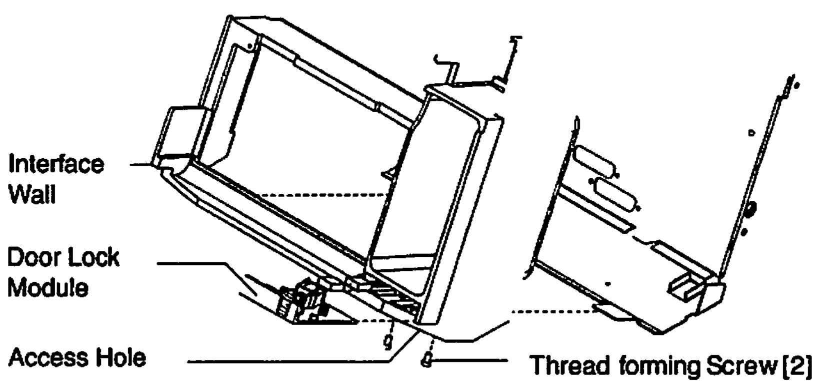
Tools and Supplies

- Phillips screwdriver, #1
- small flat-blade screwdriver

1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the door lock module:
   a. Slide the front of the system to the edge of the work surface.

      Using a small flat-blade screwdriver, access the door lock solenoid through the middle hole of the three access holes in the bottom front right corner of the system and push the solenoid toward the back of the system until the front door opens.

      Remove the two screws securing the door lock module.



   b. Slide the door lock module from the front of the interface wall.
   c. Disconnect the door switch connector.
3. Install the new door lock module.

Replacing the Hard Drive

BIOHAZARD: Refer to *Biohazards and Warnings.*

WARNING Electrical shock hazard. Refer to *Biohazards and Warnings.*

CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

Tools and Supplies

- Allen wrench, 5/64
- Phillips screwdriver, #1

CAUTION: After replacing the hard drive, the touch screen must be recalibrated. Refer to Calibrations, for instructions on calibrating the touch screen.

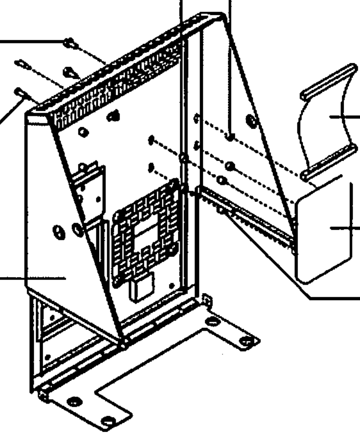
NOTE: Before you begin, record the information from the Service Data screen and the IP addresses from the Communications screen if required, and save the Setup data. Refer to Section 6 in the *Rapidpoint 400 Series Operator's Manual* to save the Setup data.

1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the rear cover and power module assembly. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.

NOTE: Retain grommets and nylon spacers after removing the hard drive.

3. Remove the hard drive:
   a. Disconnect the hard drive cable from the hard drive and retain the cable.

b. Using the Allen wrench, pull on the hard drive while loosening the four shoulder screws at the rear of the power module frame until the hard drive is removed. Do not remove the screws.



NOTE: Always assemble the hard drive cable to the hard drive before mounting the hard drive to the power module frame.

Ensure that the nylon spacers remain on the longer screws.

CAUTION: When reconnecting the hard drive cable, align the connector with the four pins on the disk drive. If misaligned, serious damage can occur to the hard drive.

4. Install the new hard drive:

   a. Before connecting the hard drive cable, align the cable with the four pins.

   b. Install the hard drive.

5. Ensure that the hard drive cable is correctly reconnected to the UIP board.

6. Reassemble in the reverse order. Refer to *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378.

NOTE: Do not connect the external network cable at this time.

7. Complete the installation of the system:
    a. Perform the emergency calibration of the touch screen during start up. Refer to *Emergency Calibration of the Touch Screen* in *Calibrations.*
    b. Enter the data on the Service Data screen.
    c. Restore the setup data.
    d. Enter the IP addresses if required.
    e. Reconnect the external network cable.
    f. Install a new measurement cartridge.

Replacing the Power Supply Module

BIOHAZARD: Refer to *Biohazards and Warnings.*

WARNING Electrical shock hazard. Refer to *Biohazards and Warnings.*

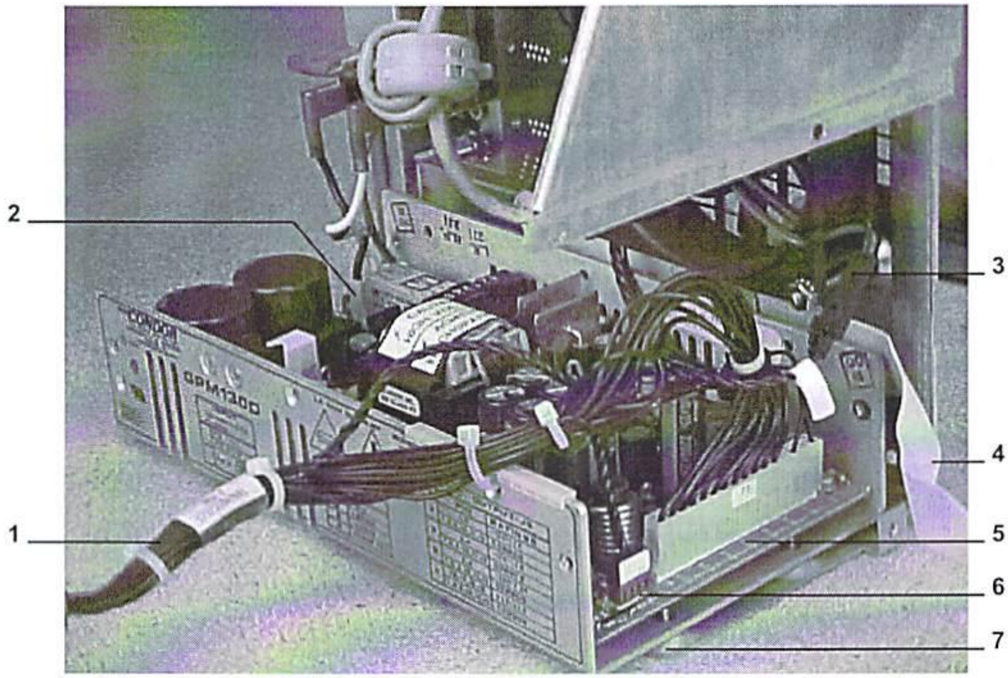
CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

Tools and Supplies

- Phillips screwdriver, #1
- Allen wrench, 5/64

1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the rear cover and power module assembly. Refer to *Removing the Rear Cover and Power Module* on page 375.
3. Remove the power supply module:
   a. Cut the cable tie securing the DC power harness to the frame.
   b. Disconnect the cables from J1, J2, and J3.
   c. Remove the cables from the cable clamp.
   d. Remove the four Phillips-head screws at the bottom of the power module.

e. Lift the power supply module up and out of the power module frame.



1 DC power harness

2 Cable at J1

3 Plug to fan

4 Rear interconnect board cable

5 Cable at J3

6 Cable at J2

7 Screws under frame (4)

4. Install the new power supply module.

5. Reconnect cables to J1, J2, and J3.

6. Ensure that all cables are not crimped or pinched.

7. Reassemble in the reverse order. Refer to *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378.

Replacing the Fan

BIOHAZARD: Refer to *Biohazards and Warnings*.

WARNING Electrical shock hazard. Refer to *Biohazards and Warnings*.

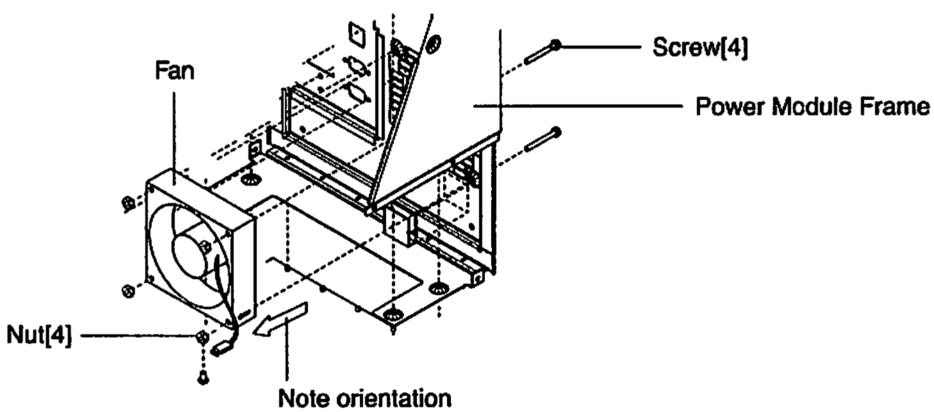
CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

Tools and Supplies

- Phillips screwdriver, #1

1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the rear cover and power module assembly. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.
3. Remove the fan (four screws on the back of the power module) and disconnect the cable.
4. Pass the rear interconnect cable and the DC power harness from the Main board.

NOTE: Install the new fan with the air flow arrow pointing toward the system interior and connect the cable. Ensure that the cable is close to its connector on replacement.



5. Reassemble in the reverse order. Refer to *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378.

Replacing the Power Entry Module With Switch

BIOHAZARD: Refer to *Biohazards and Warnings*.

WARNING Electrical shock hazard. Refer to *Biohazards and Warnings*.

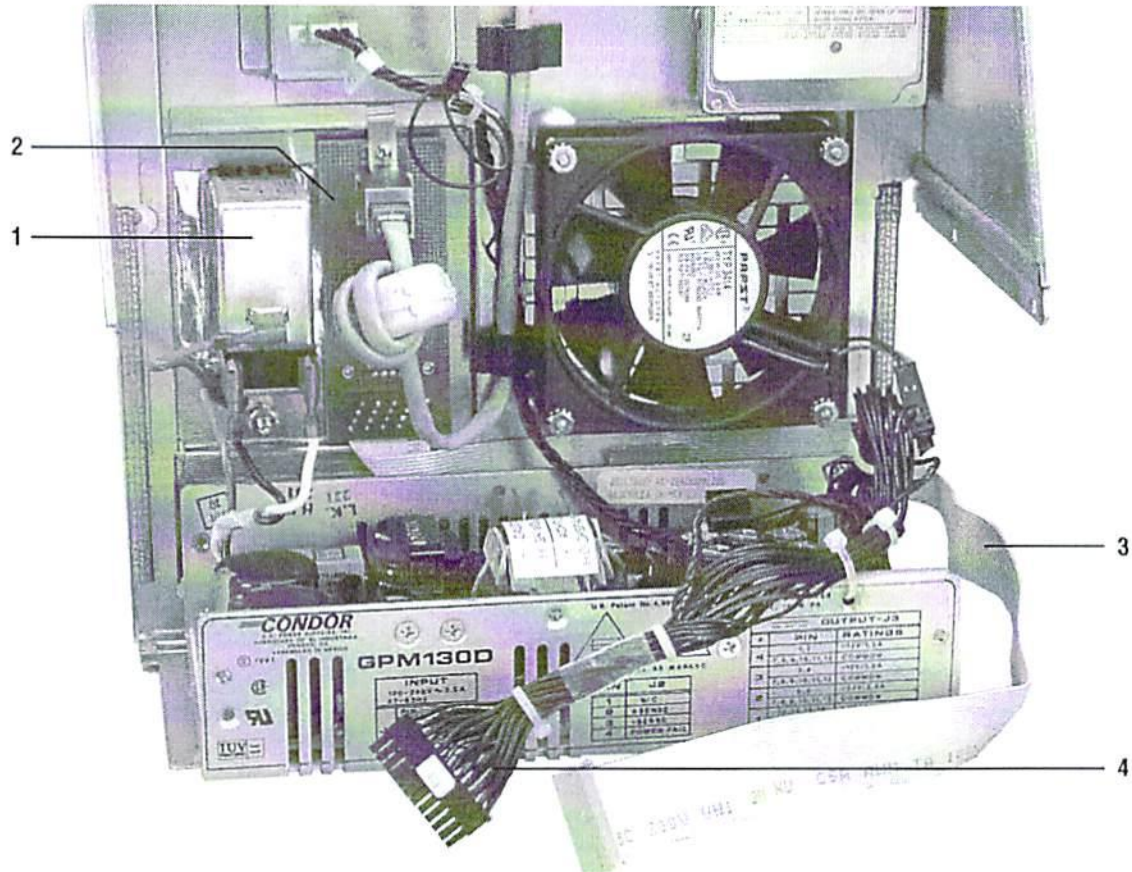
CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

Tools and Supplies

- Phillips screwdriver, #1

1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the rear cover and power module assembly. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.
3. Disconnect the power entry module from the power supply (J1).

4. Remove the grounding tag.



1 Power entry module with switch

2 Rear interconnect board

3 Rear interconnect cable

4 DC power harness

5. Remove the rear interconnect board. Refer to *Removing the Rear Interconnect Board* on page 343.
6. Remove the conductive tape from the sides of the power entry module.
7. With a screw driver, push down on the spring locks on the top and bottom of the power entry module and push the power entry module out of the frame.
8. Install the new power entry module:
   a. Pass the power entry module cable harness through the slot.
   b. Insert the power entry module into the frame until it locks in place.

c. Attach conductive tape to each side.

d. Reconnect the power entry module to the power supply.

e. Reconnect the grounding tag.

9. Install the rear interconnect board.

Replacing the Rear Interconnect Board

BIOHAZARD: Refer to *Biohazards and Warnings.*

WARNING Electrical shock hazard. Refer to *Biohazards and Warnings.*

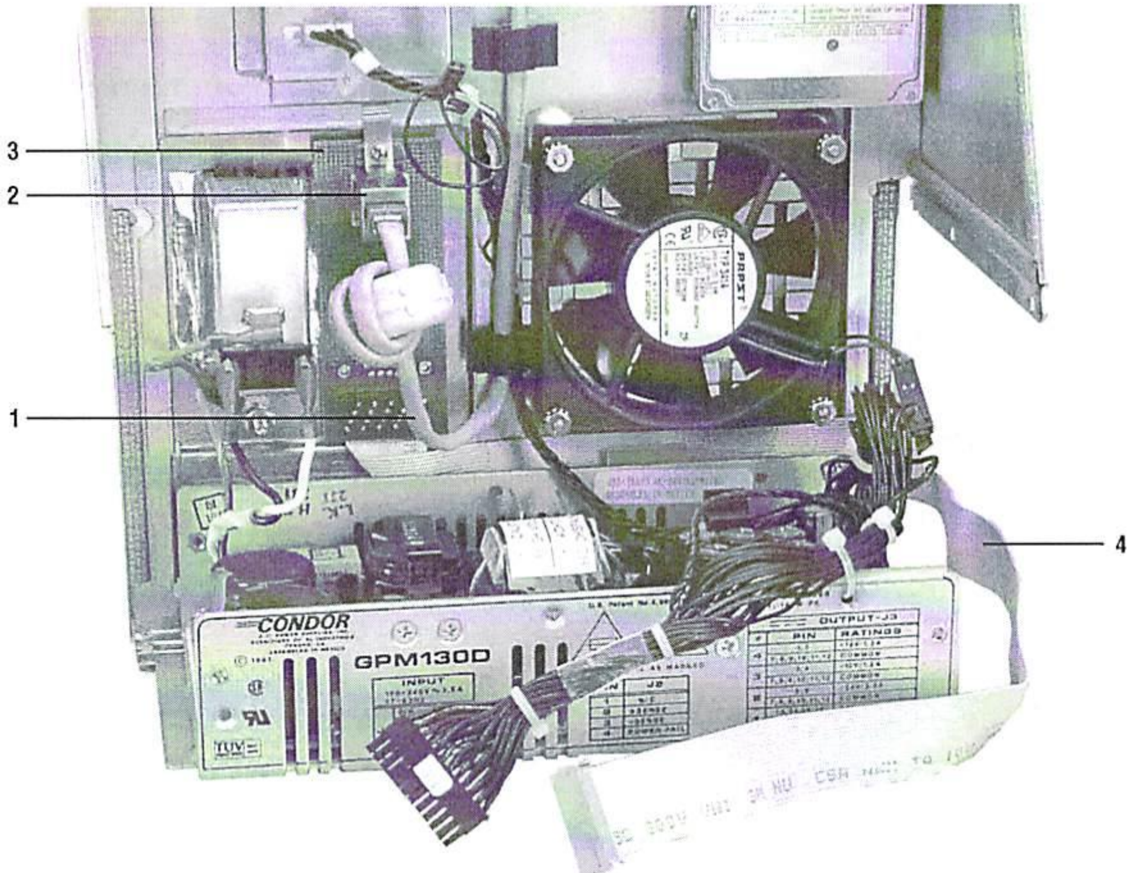
CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

Tools and Supplies

- Phillips screwdriver, #1
- 1/4 inch hex driver

1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the rear cover and power module assembly. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.

3. Disconnect the patch cord from the in-line coupler on the rear interconnect board.



1 Patch cord

2 In-line coupler

3 Rear interconnect board

4 Rear interconnect cable

---

4. Remove the rear interconnect board:

NOTE: The rear interconnect cable is soldered to the board.

   a. Remove the four hex standoffs from the frame.

   b. Remove the screw holding the clip at the top of the board.

5. Remove the in-line coupler from the board.

6. Install the new rear interconnect board, and reinstall the in-line coupler.

Replacing the Pump Roller Cages

BIOHAZARD: Refer to *Biohazards and Warnings.*

WARNING Electrical shock hazard. Refer to *Biohazards and Warnings*.

CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

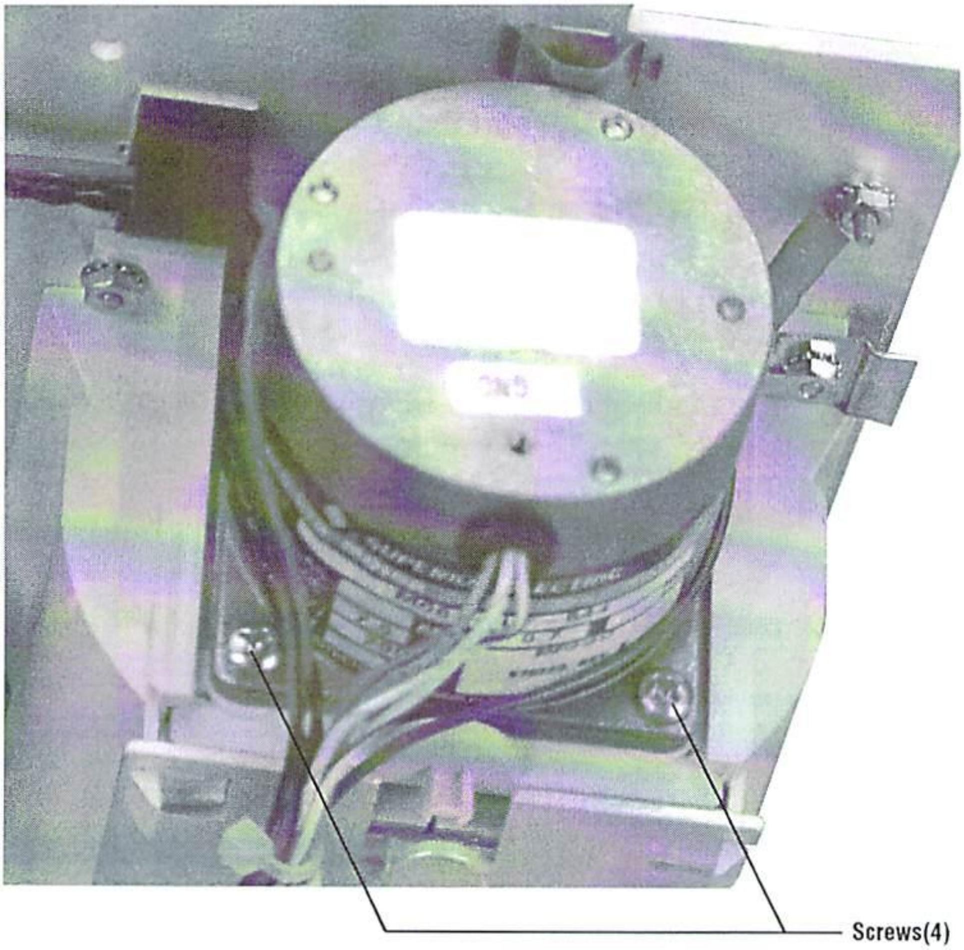
Tools and Supplies

- Phillips screwdriver
- small flat-blade screwdriver

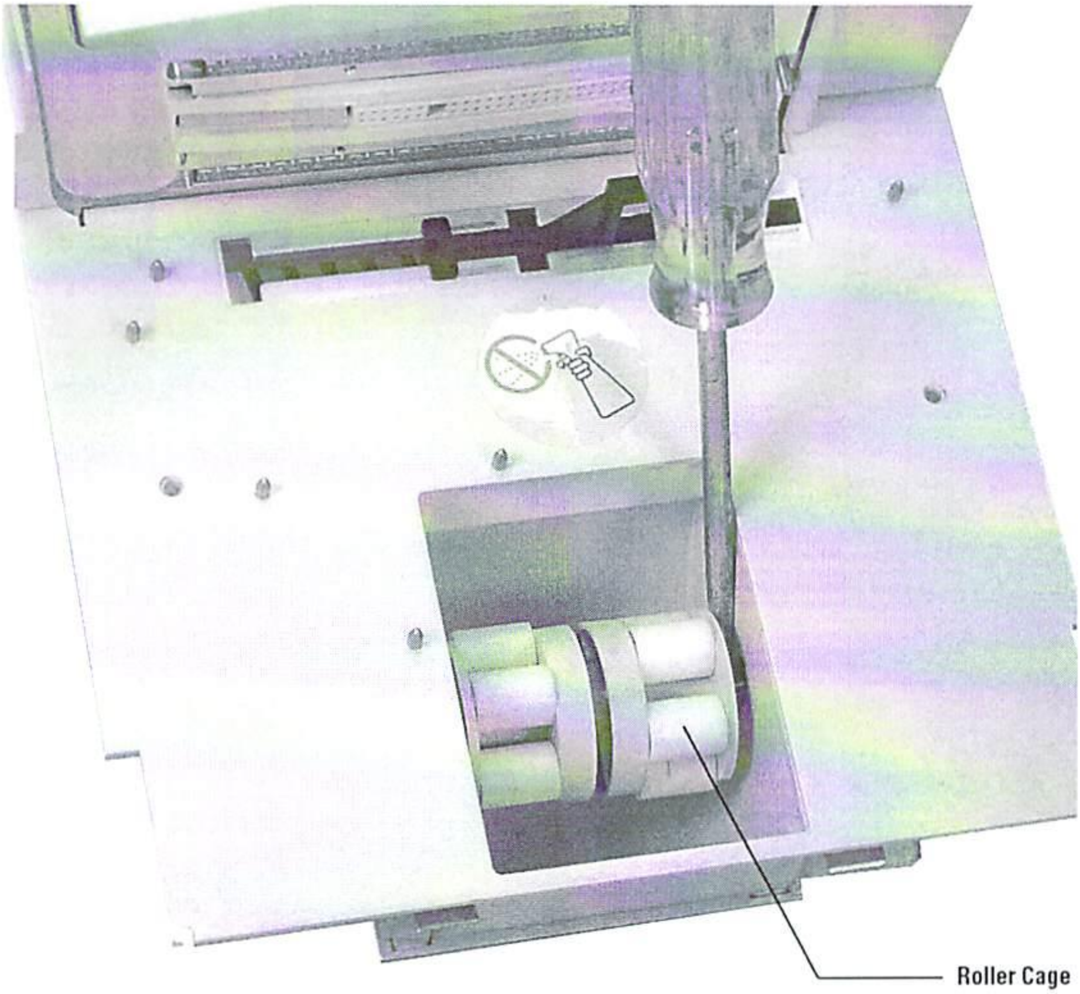
1. Turn the system off and disconnect the external cables (power, LIS, and bar code reader) from the back of the system.
2. Remove the rear cover. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.
3. Remove the cartridge interface assembly. Refer to *Replacing the Cartridge Interface Assembly* on page 309.

4. Remove the pump motor on the right-hand side as viewed from the front (opposite side to the cartridge release lever):

   a. Remove the four thread-forming screws from the motor mount.



b. Pry the pump roller cage free of the motor shaft while pulling the motor toward you.



c. Remove the second pump roller cage by prying it free of the motor shaft.

5. Install the new pump roller cages:

   a. Slide the roller cage onto the shaft of the motor housing with the flat of the cage towards the flat of the housing.

   b. Push the roller cage until the cage is fully seated.

   c. Replace the motor and press until the cage and motor are fully seated.

   d. Replace the four screws.

6. Check that there is a gap between the roller cages.

NOTE: When reinstalling the cartridge interface assembly, do not bump the spring plate and locking tabs on the pump housing or the spring plate can pop off and interfere with system operation.

7. Reassemble in the reverse order. Refer to *Replacing the Cartridge Interface Assembly* on page 309 and *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378.

Replacing the Pump Motors

BIOHAZARD: Refer to *Biohazards and Warnings.*

WARNING Electrical shock hazard. Refer to *Biohazards and Warnings.*

CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

Tools and Supplies

- small flat-blade screwdriver
- Phillips screwdriver
- pin extractor

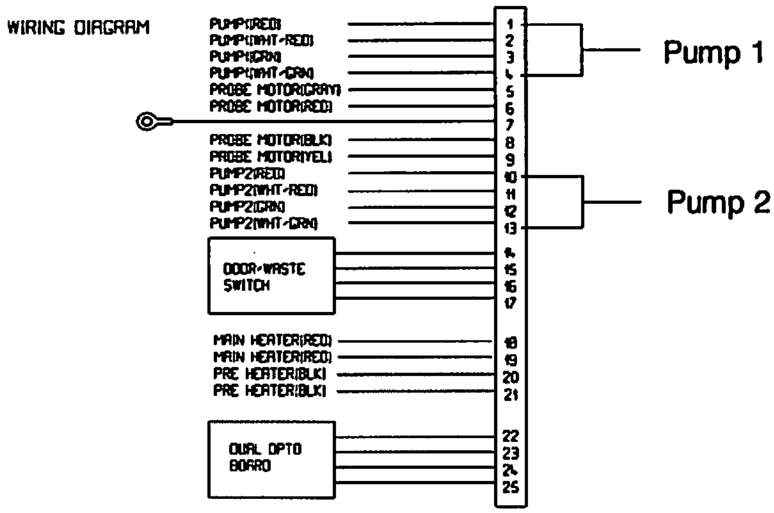
NOTE: Replace both roller cages.

1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the rear cover. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.
3. Remove the cartridge interface assembly. Refer to *Replacing the Cartridge Interface Assembly* on page 309.
4. Disconnect the motor wires:

NOTE: Remove the motor wires one at a time.

   a. Cut the cable ties that secure the motor wires.

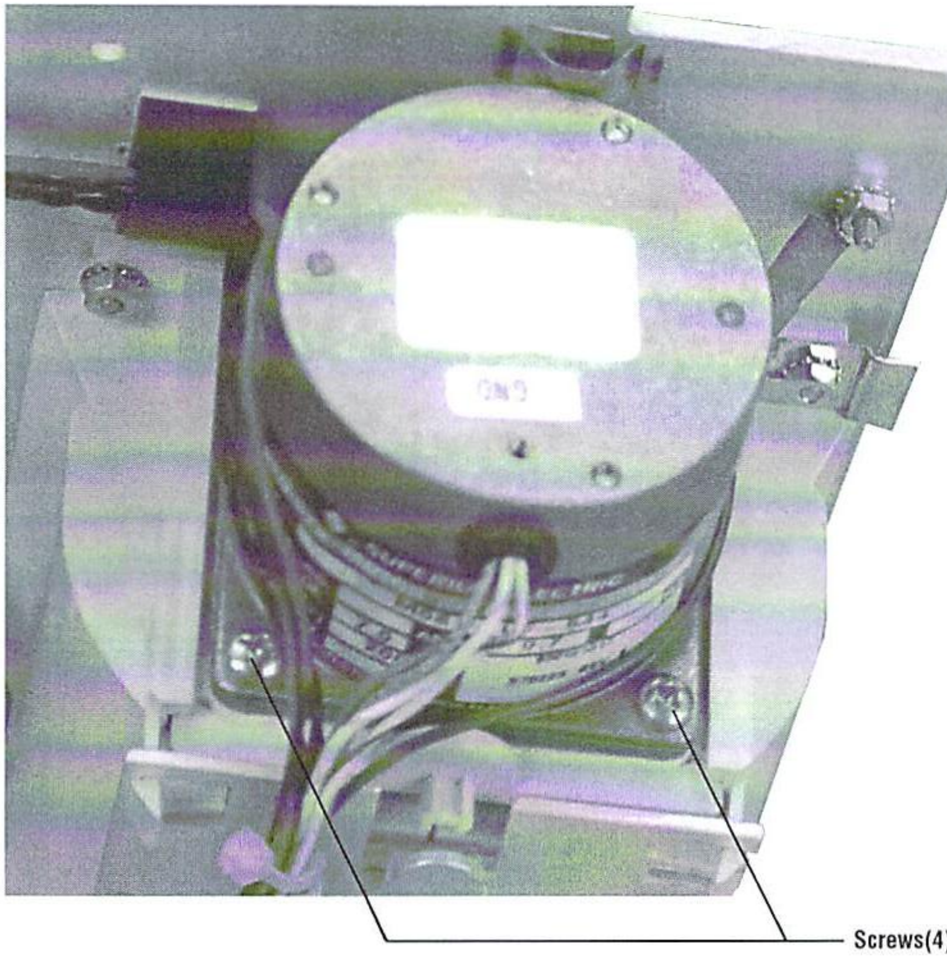
b. Using the pin extractor, disconnect the motor wires from the outboard cable harness D-connector.



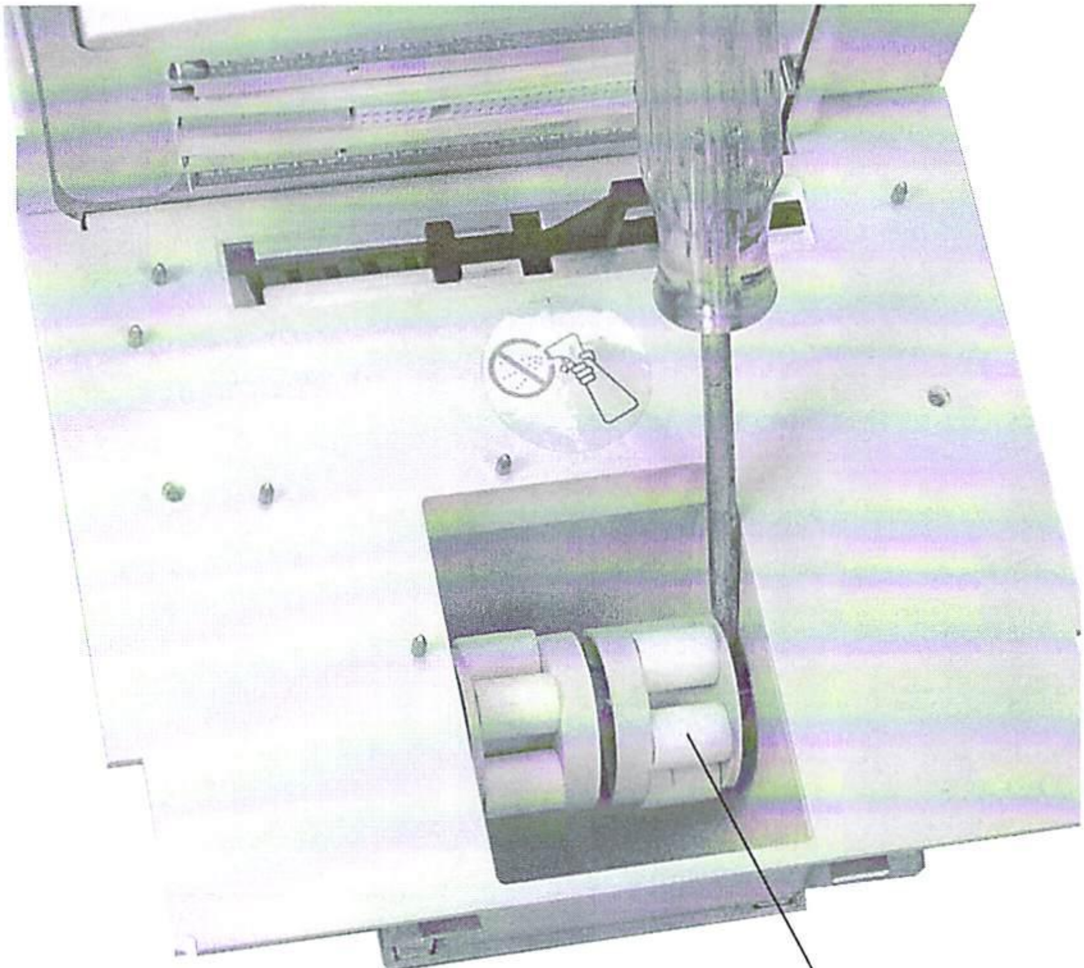
5. Remove the motor.

WARNING Do not reverse the motors when removing or replacing them or the new system will not function correctly.

a. Remove the four thread-forming screws from the motor mount.



b. Pry the pump roller cage free of the motor shaft while pulling the motor toward you.



WARNING Do not reverse the motors when removing or replacing them or the new system will not function correctly.

⚠ **CAUTION:** Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

6. Install the new motor:

   a. Position the roller cage in the housing with the flat of the roller facing the flat of the housing.

⚠ **CAUTION:** Position the motor so that the wires are furthest from the housing.

   b. Replace the motor by pressing it until the cage and motor are fully seated.

c. Replace the four screws.

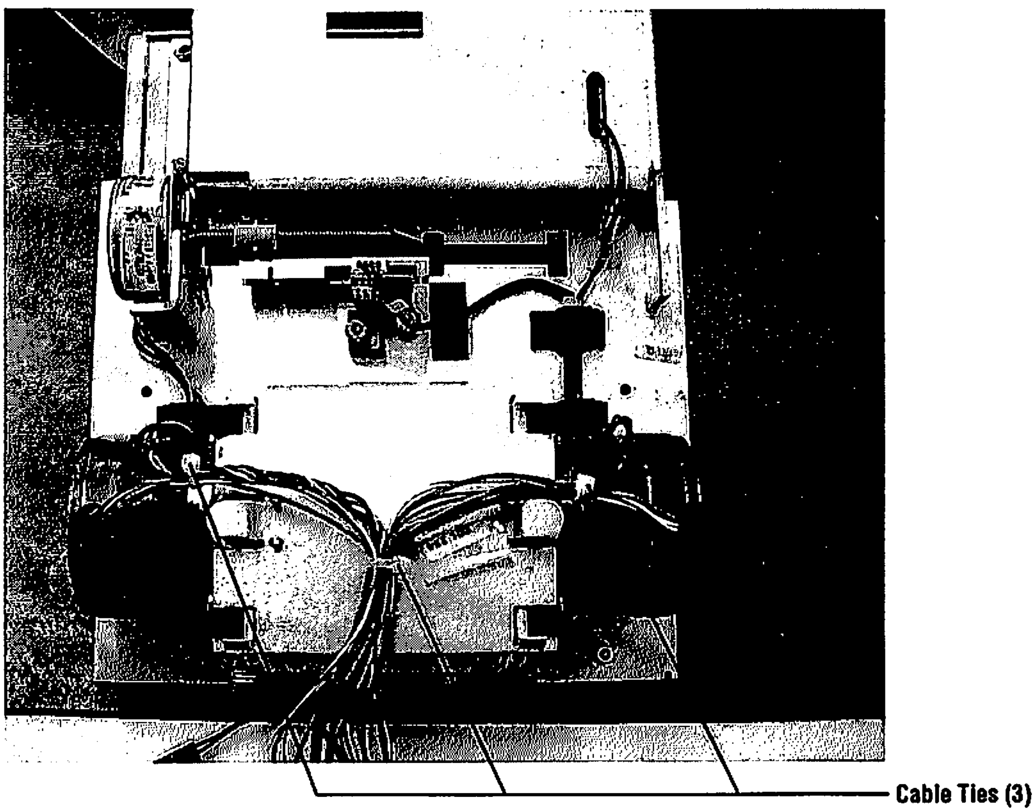
d. Route the motor wires over the top of the motor and using the small flat-blade screwdriver, connect it to the outboard cable harness.

   Ensure that the wires are not located in any pinch points of the motor.

   Ensure that the pins are seated securely in the outboard cable harness.

NOTE: When reinstalling the cartridge interface assembly, do not bump the spring plate and locking tabs on the pump housing or the spring plate can pop off and interfere with system operation.

7. Secure the wires with cable ties.



8. Reassemble in the reverse order. Refer to *Replacing the Cartridge Interface Assembly* on page 309 and *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378.

Replacing the Wash/Waste Switch

BIOHAZARD: Refer to *Biohazards and Warnings.*

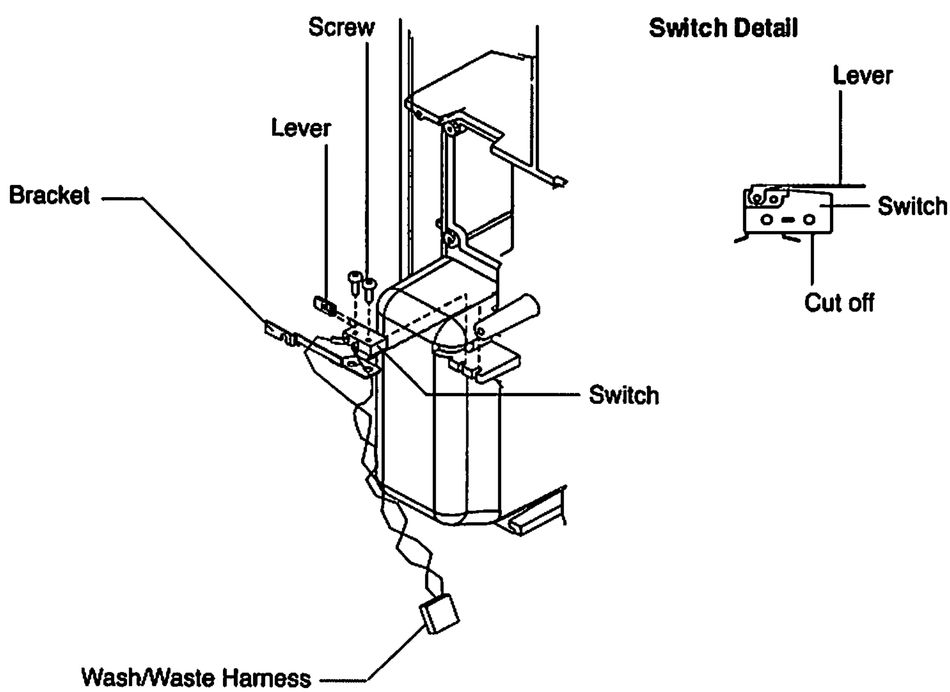
WARNING Electrical shock hazard. Refer to *Biohazards and Warnings.*

CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

Tools and Supplies

- small flat-blade screwdriver

1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the rear cover. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.
3. Remove the ampule breaker and AQC frame assembly cover, or the AutomaticQC cartridge.
4. Remove the AQC frame assembly. Refer to *Replacing the AutomaticQC Frame Assembly* on page 320.
5. Remove the cartridge interface assembly. Refer to *Replacing the Cartridge Interface Assembly* on page 309.
6. Remove the wash/waste switch:



a. Loosen the two screws securing the wash/waste switch to the rear of the interface wall. Do not remove the screws.

b. From the front of the system push the wash/waste switch assembly towards the back, and from the side push it towards the center of the system and remove from the rear of the system.

c. Disconnect the wash/waste connector from the outboard cable harness.

7. Install the new wash/waste switch assembly:

   a. Place the switch assembly on the interface wall shelf, orientation will be at an angle.

   b. Pull the switch up so that the shelf is positioned between the bracket and the switch.

   c. Tighten the screws. Align the switch with the lever protruding through the wash/waste access cavity.

   d. Connect the wash/waste connector to the outboard cable harness.

8. Reassemble in the reverse order. Refer to *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378.

9. Replace the AQC frame assembly, the ampule breaker (if present), and cover assembly.

Replacing the Fiber Bundle Assembly

BIOHAZARD: Refer to *Biohazards and Warnings.*

WARNING Electrical shock hazard. Refer to Biohazards and Warnings.

Tools and Supplies

- Phillips screwdriver, #1

1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the rear cover and power module assembly. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.
3. Remove the cartridge interface assembly. Refer to *Replacing the Cartridge Interface Assembly* on page 309.

CAUTION: Do not bend, twist, or crimp the fiber bundle as this can damage the optical fibers resulting in erroneous optics readings.

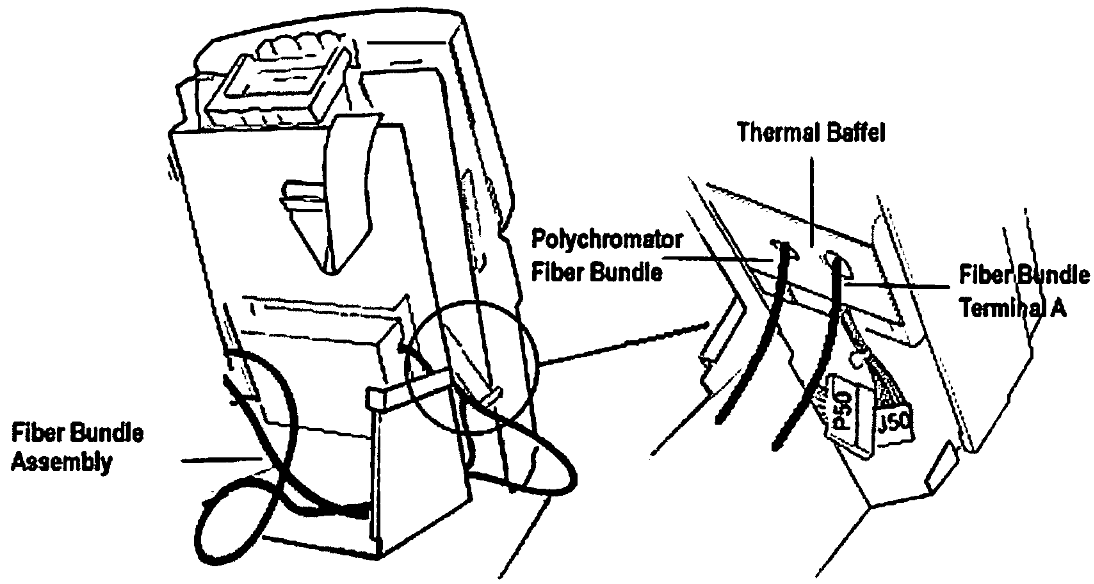
CAUTION: Handle the fiber bundle with care being careful not to damage the defusing material at each end of the cable as this can result in erroneous optics readings.

4. Remove the fiber bundle assembly.
   a. Disconnect the four sections of the fiber bundle assembly:

Disconnect . . .	**From the . . .**
the fiber bundle assembly	sample chamber interface assembly (terminal A)
	photo-feedback detector at U3 on main board (terminal D)
	neon board assembly (terminal C)
	illumination housing assembly (terminal B)

   b. Carefully remove the fiber bundle from the two cable clamps.

c. Slide the fiber bundle (terminal A) through the thermal baffle access hole and discard.



⚠ **CAUTION:** When reconnecting the fiber bundle, ensure that the fiber bundle bottoms out in the connector to avoid erroneous optics readings.

NOTE: When installing a new fiber bundle assembly, keep the protective caps on the ends until making connections as damage to the defusing material can result in erroneous optics readings.

5. Reconnect the new fiber bundle assembly.
6. Check that the fiber bundle is not bunched or crimped.
7. Reassemble in the reverse order. Refer to *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378
8. Perform all system tests to ensure proper system operation.

Replacing the Neon Board Assembly

BIOHAZARD: Refer to *Biohazards and Warnings*.

WARNING Electrical shock hazard. Refer to Biohazards and Warnings.

Tools and Supplies

- Phillips screwdriver, #1

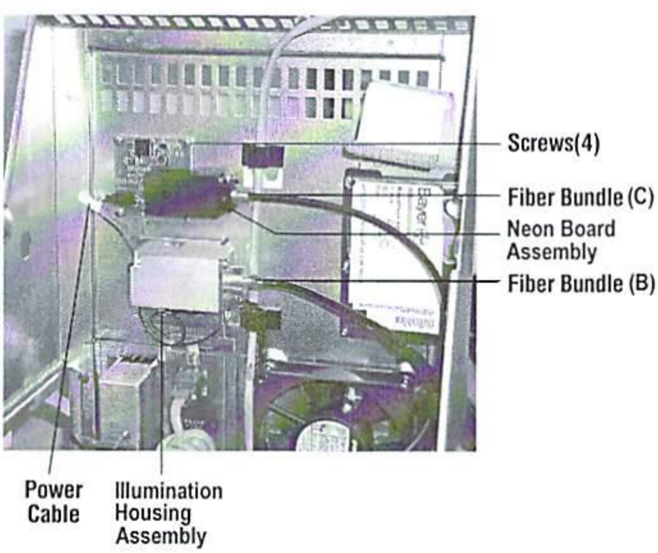
1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the rear cover and power module assembly. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.
3. Remove the neon board assembly:

   a. Disconnect the neon power cable (P6).

CAUTION: Do not bend, twist, or crimp the fiber bundle as this can damage the optical fibers resulting in erroneous optics readings.

CAUTION: Handle the fiber bundle with care being careful not to damage the defusing material at each end of the cable as this can result in erroneous optics readings.

   b. Pull up on the spring clip securing the fiber bundle to the neon board assembly, then grasp the ferrule and remove the fiber bundle.



c. Using a Phillips screwdriver, remove the four Phillips screws securing the neon board assembly and retain.

d. Remove the neon board assembly.

4. Install the new neon board assembly with the four screws.
5. Reconnect the fiber bundle to the neon board assembly and secure with the spring clip.
6. Reconnect the neon power cable (P6). Ensure that the wires are dressed correctly.
7. Check that the fiber bundle is not bunched or crimped.
8. Reassemble in the reverse order. Refer to *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378.
9. Perform all system tests to ensure proper system operation.

Replacing the Illumination Housing Assembly

BIOHAZARD: Refer to *Biohazards and Warnings.*

WARNING Electrical shock hazard. Refer to Biohazards and Warnings.

Tools and Supplies

- Phillips screwdriver, #1

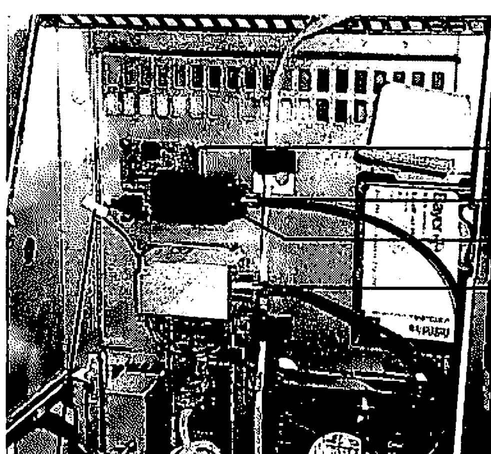
1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the rear cover and power module assembly. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.
3. Remove the illumination housing assembly:

CAUTION: Do not bend, twist, or crimp the fiber bundle as this can damage the optical fibers resulting in erroneous optics readings.

CAUTION: Handle the fiber bundle with care being careful not to damage the defusing material at each end of the cable as this can result in erroneous optics readings.

a. Disconnect the fiber bundle from the illumination housing assembly.

b. Using a Phillips screwdriver, remove the two Phillips screws, located at the rear of the frame securing the illumination housing assembly and retain.



c. Remove the illumination housing assembly.

4. Install the new illumination housing assembly using the two screws.

⚠ **CAUTION:** When reconnecting the fiber bundle, ensure that the fiber bundle bottoms out in the connector to avoid erroneous optics readings.

5. Reconnect the fiber bundle to the illumination housing assembly.
6. Check that the fiber bundle is not bunched or crimped.
7. Reassemble in the reverse order.Refer to *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378
8. Perform all system tests to ensure proper system operation.

Replacing the Polychromator Module

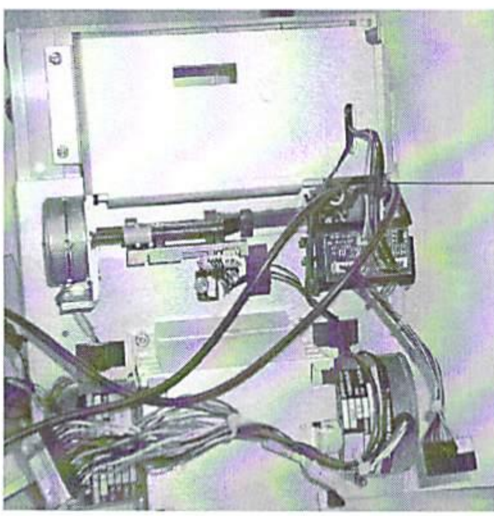
BIOHAZARD: Refer to *Biohazards and Warnings*.

WARNING Electrical shock hazard. Refer to Biohazards and Warnings.

Tools and Supplies

- Phillips screwdriver, #1
- small flat-blade screwdriver
- hex driver

1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the rear cover and power module assembly. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.
3. Remove the cartridge interface assembly. Refer to *Replacing the Cartridge Interface Assembly* on page 309.
4. Remove the polychromator module:



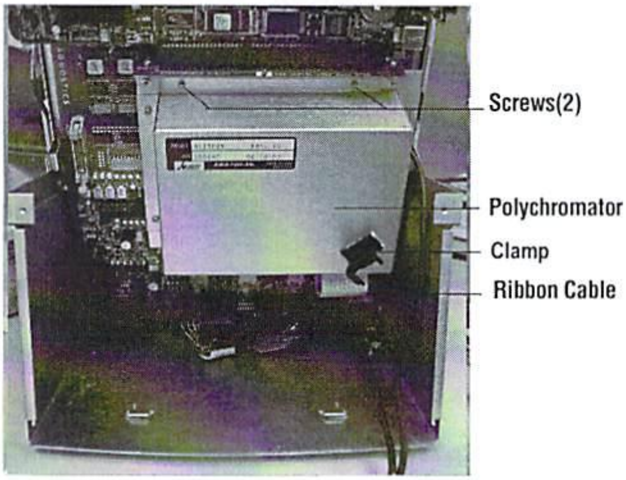
   a. Disconnect the polychromator fiber bundle from sample chamber interface assembly.

CAUTION: Do not bend, twist, or crimp the fiber bundle as this can damage the optical fibers resulting in erroneous optics readings.

⚠ **CAUTION:** Handle the fiber bundle with care being careful not to damage the defusing material at each end of the cable as this can result in erroneous optics readings.

b. Pass the polychromator fiber bundle through the thermal baffle access hole.

c. Using a Phillips screwdriver, remove the two screws from the standoffs located on the top of the bracket of the Main Interconnect board that secure the polychromator and retain.



d. Loosen the screw (do not remove) on the bottom of the polychromator.

e. Disconnect the ribbon cable from the Main board.

f. Remove the polychromator module.

5. Install the new polychromator module:

⚠ **CAUTION:** Do not bend, twist, or crimp the fiber bundle as this can damage the optical fibers resulting in erroneous optics readings.

⚠ **CAUTION:** Handle the fiber bundle with care being careful not to damage the defusing material at each end of the cable as this can result in erroneous optics readings.

a. Reconnect the ribbon cable to at J7 on the Main board and lock the connector, note the orientation key.

b. Place the bottom of the polychromator on the 1 inch standoff, and insert the two long screws to the standoffs at the top located on the bracket of the Main Interconnect board. Tighten all screws.

c. Pass the fiber bundle through the thermal baffle access hole.

d. Carefully connect the polychromator fiber bundle to the sample chamber interface assembly.

6. Check that the fiber bundle is not bunched or crimped.

7. Reassemble in the reverse order. Refer to *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378.

8. Perform all system tests to ensure proper system operation.

Replacing the Sample Chamber Interface Assembly

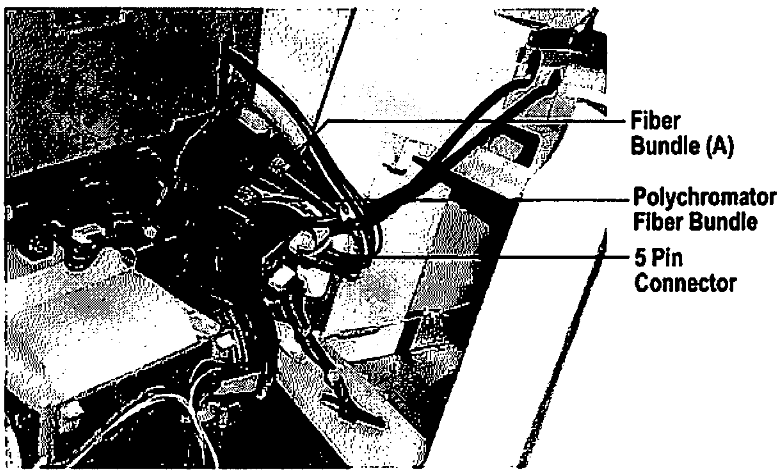
BIOHAZARD: Refer to *Biohazards and Warnings.*

WARNING Electrical shock hazard. Refer to Biohazards and Warnings.

Tools and Supplies

- Phillips screwdriver, #1
- small flat-blade screwdriver

1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the cartridge interface assembly. Refer to *Replacing the Cartridge Interface Assembly* on page 309.
3. Remove the rear cover and power module assembly. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.
4. Disconnect both the polychromator fiber bundle and the fiber bundle (terminal A) from the sample chamber interface assembly.



5. Remove the sample chamber interface assembly.
6. Install the new sample chamber interface assembly.
   a. Remove the two protective boots covering the optical heads.

CAUTION: Do not bend, twist, or crimp the fiber bundles as this can damage the optical fibers resulting in erroneous optics readings.

CAUTION: Handle the fiber bundles with care being careful not to damage the defusing material at each end of the cable as this can result in erroneous optics readings.

   b. Reconnect the polychromator fiber bundle and fiber bundle to the sample chamber interface assembly.

7. Check that the fiber bundle is not bunched or crimped.
8. Reassemble in the reverse order. Refer to *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378.
9. After reassembly, ensure that the optics head pivots, springs, and moves easily from side-to-side.
10. Perform all system tests to ensure proper system operation.

Replacing the Main Board

BIOHAZARD: Refer to *Biohazards and Warnings.*

WARNING Electrical shock hazard. Refer to *Biohazards and Warnings.*

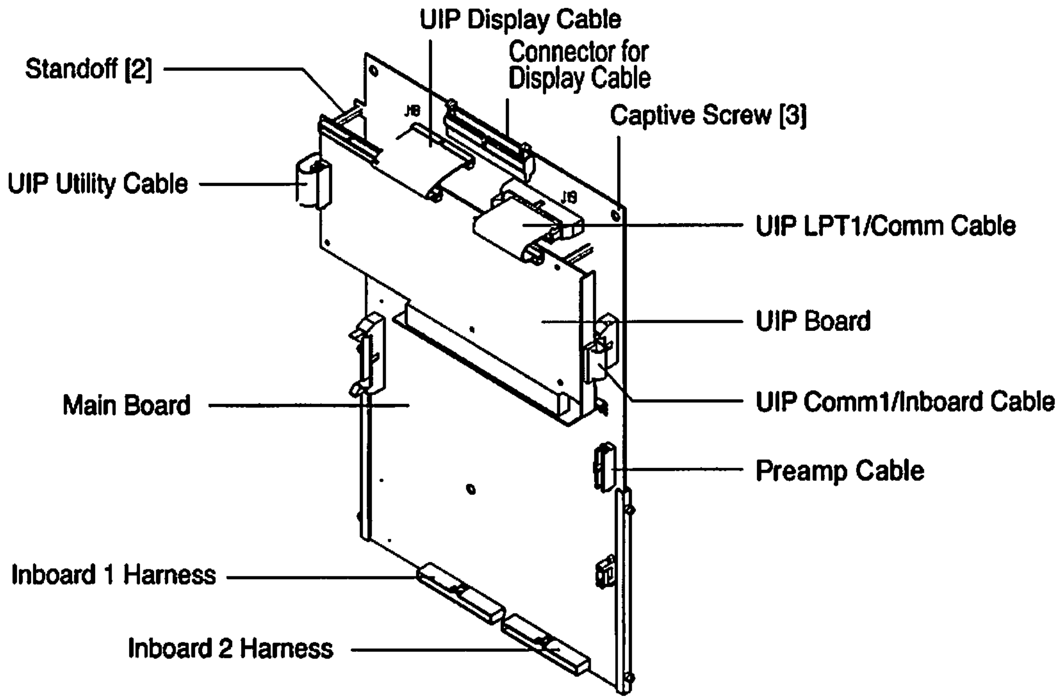
CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

Tools and Supplies

- Phillips screwdriver #1

1. Turn the system off and disconnect all the external cables (power, LIS, and bar code reader) from the back of the system.
2. Remove the rear cover and power module assembly. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.
3. 405 Remove the polychromator:
   a. Using a Phillips screwdriver, remove the two screws from the standoffs located on the bracket of the Main Interconnect board that secure the polychromator and retain.
   a. Loosen the screw (do not remove) on the bottom of the polychromator located on the 1 inch standoff.
   b. Disconnect the ribbon cable from the Main board.
   c. Remove the polychromator and set to the side.
   d. Remove the 1 inch standoff (and screw) that secures the bottom of the polychromator and retain.
4. 405 Remove the fiber bundle (terminal D) at U3 on the main board.
5. Disconnect the two inboard harness (1 and 2) cables at the bottom of the Main board and the preamp cable at the side.
6. Disconnect the following cables from the Main board:
   - display cable
   - diskette power cable (2 pin)
   - diskette data cable
   - preamp cable

7. Remove the two screws from the standoffs on the Main Interconnect board.
8. Remove the three screws on the Main board: two at the top and one in the bottom center of the board.



9. Pivot the Main board toward you while sliding the board out of the card guides.
10. Disconnect the following cables from the Main Board:
    - UIP display cable
    - UIP utility cable
    - UIP LTPT1/comm cable
    - UIP comm1.inboard cable
11. Remove the three screws and the copper, grounding clips from the rear of the Main board and retain.
12. Remove the UIP and Main Interconnect boards.

NOTE: Ensure the new Main board SW1 switches are set at OFF (up).

13. Reinstall the UIP and Main Interconnect board to the Main board. Ensure the placing clips are attached with the three screws on the rear of the Main board.

14. Reconnect the cables to the Main board.
15. Install the new Main board:
    a. Insert the Main board into the card guides and firmly press it down while sliding into position.
    b. Push the card guides back into position.
    c. Ensure that the Main board is correctly positioned within the frame.
    d. Reinstall the three screws on the Main board.
    e. 405 Reinstall the 1 inch standoff (with screw) and the fiber bundle (terminal D) at U3 on the Main board.
    f. Reinstall the two screws to the standoffs on the Main Interconnect board.
    g. Reconnect all the cables.
16. 405 Reinstall the polychromator:
    a. Reconnect the ribbon cable to at J7 on the Main board and lock the connector, note the orientation key.
    b. Place the bottom of the polychromator on the 1 inch standoff, and insert the two long screws to the standoffs at the top located on the bracket of the Main Interconnect board. Tighten all screws.
17. Reassemble in the reverse order. Refer to *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378.

Replacing the UIP Board

BIOHAZARD: Refer to *Biohazards and Warnings.*

WARNING Electrical shock hazard. Refer to *Biohazards and Warnings.*

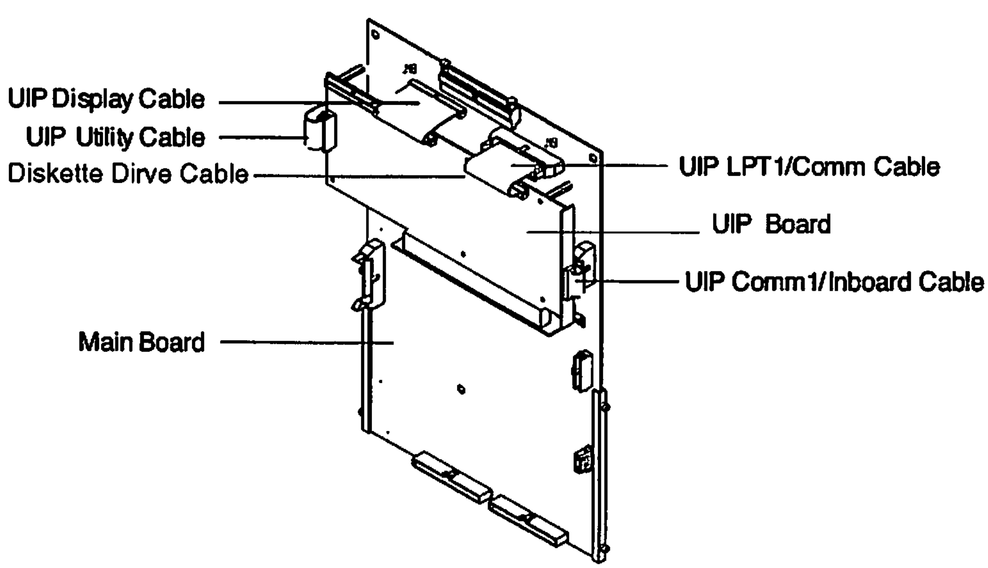
CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

NOTE: When removing the UIP board and the Main Interconnect board as a unit, remove the three screws from the back of the Main board.

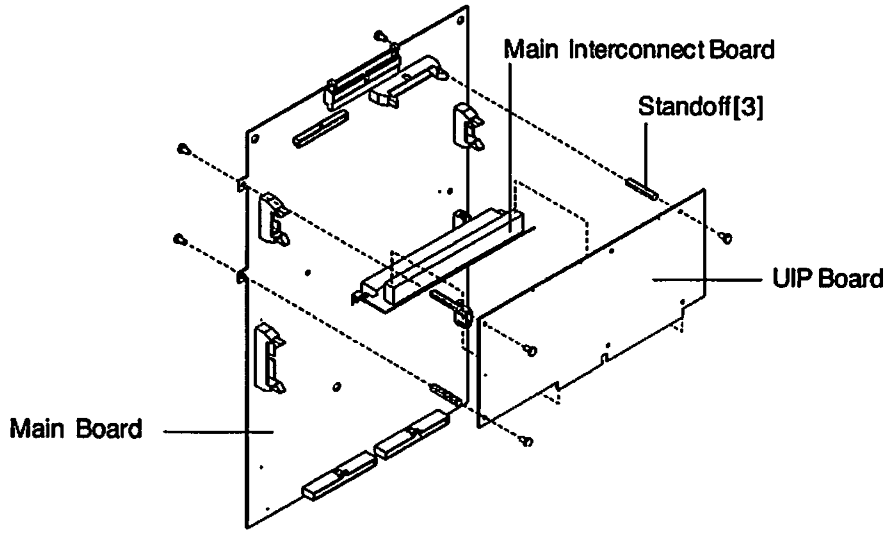
Tools and Supplies

- Phillips screwdriver, #1

1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the rear cover and power module assembly. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.
3. Disconnect following cables from the UIP board:
   - UIP display cable
   - UIP utility cable
   - Diskette drive cable
   - UIP LPT1/comm cable
   - UIP comm1/inboard cable



4. Remove the three screws securing the UIP board to the standoffs.
5. Remove the UIP board from the Main Interconnect board.



6. Install the new UIP board.
7. Reconnect all the cables.
8. Reassemble in the reverse order. Refer to *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378.

Replacing the Main Interconnect Board

BIOHAZARD: Refer to *Biohazards and Warnings.*

WARNING Electrical shock hazard. Refer to *Biohazards and Warnings.*

CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

NOTE: When removing the UIP board and the Main Interconnect board as a unit, remove the three screws from the back of the Main board.

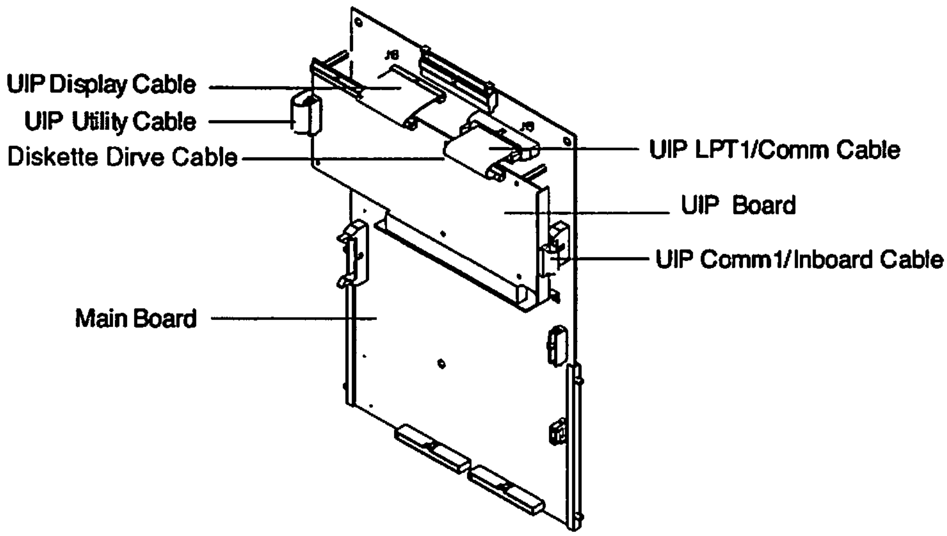
Tools and Supplies

- Phillips screwdriver, #1

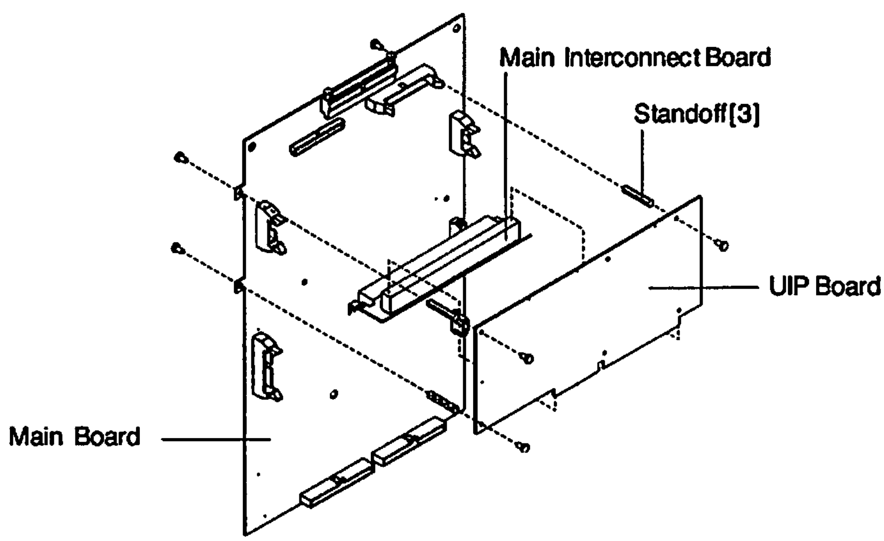
1. Turn the system off and disconnect all the external cables from the back of the system.
2. Remove the rear cover and power module assembly. Refer to *Removing the Rear Cover and Power Module Assembly* on page 375.

405 3. Remove the polychromator:
   a. Using a Phillips screwdriver, remove the two screws from the standoffs located on the bracket of the Main Interconnect board that secure the polychromator and retain.
   a. Loosen the screw (do not remove) on the bottom of the polychromator located on the 1 inch standoff.
   b. Disconnect the ribbon cable from the Main board.
   c. Remove the polychromator and set to the side.

4. Disconnect the following cables from the UIP board:
   - UIP display cable
   - UIP utility cable
   - Diskette drive
   - UIP LPT1/comm cable
   - UIP comm1/inboard cable



5. Remove the three screws securing the UIP board to the standoffs.
6. Remove the UIP board from the Main Interconnect board.
7. Remove the two screws securing the Main Interconnect board to spacers on the Main board.



8. Remove the Main Interconnect board.
9. Install the new Main Interconnect board and reinstall the two screws.
10. Reinstall the UIP board and the three screws.
11. Reconnect the cables.

405 12. Reinstall the polychromator:
    a. Reconnect the ribbon cable to at J7 on the Main board and lock the connector, note the orientation key.
    b. Place the bottom of the polychromator on the 1 inch standoff, and insert the two long screws to the standoffs at the top located on the bracket of the Main Interconnect board. Tighten all screws.

13. Reinstall the power module assembly and rear cover. Refer to *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378.

Removing the Rear Cover and Power Module Assembly

BIOHAZARD: Refer to *Biohazards and Warnings.*

WARNING Electrical shock hazard. Refer to *Biohazards and Warnings.*

CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

NOTE: Remove all cartridges prior to shutting down the system if you are also replacing assemblies that require removing the cartridge interface assembly.

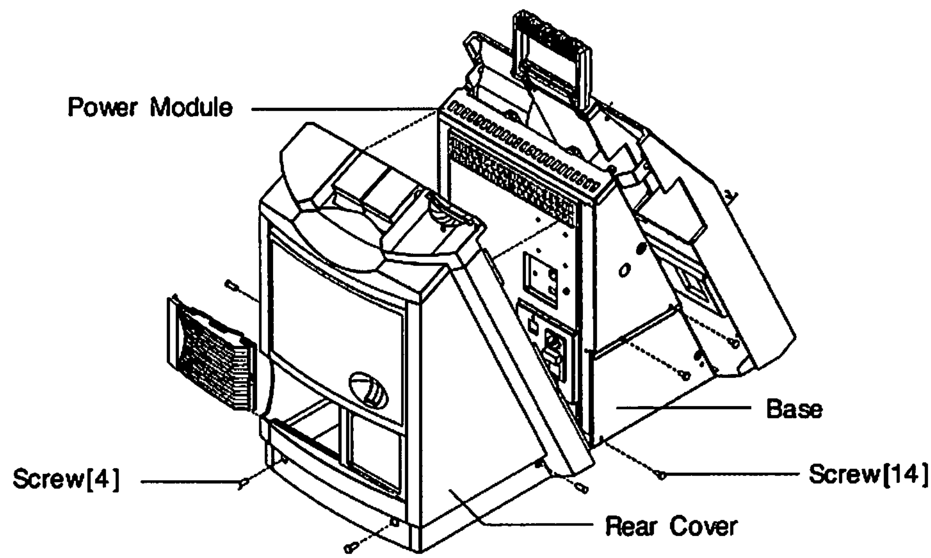
Tools and Supplies

- Phillips screwdriver, #1

1. Turn the system off and disconnect all the external cables from the back of the system.
2. (405) Remove the halogen lamp.
3. Remove the rear cover:
   a. Using the Phillips screwdriver, remove four screws: one screw on each side and two screws on the rear of the cover.

NOTE: Position the instrument handle in the up position. While sliding the cover off, do not catch the two barbed tabs located on the sides of the system base.

b. Slide the rear cover up and off the system.



4. Remove the power module assembly from the base:

NOTE: When replacing the display module, slide the power module assembly toward you until you can access the display cable. It is not necessary to completely remove the power module assembly.

a. Remove the 14 screws securing the power module frame to the base.

405 **NOTE:** As you pull the frame back, be careful not to stress the fiber bundles in the clamp on the left side of the frame.

b. Slightly spread the sides at the bottom of the power module frame while slowly pulling the frame straight back to expose the cables.

⚠ **CAUTION:** On the Rapidpoint 405 system, do not bend, twist, or crimp the fiber bundle as this can damage the optical fibers resulting in erroneous optics readings.

c. Disconnect the hard drive cable from the UIP board.

405 d. Remove the fiber bundles from the cable clamps on the frame.

e. Disconnect the patch cord (Ethernet cable) from the UIP board.

f. Disconnect the rear panel interconnect cable from the Main board.

g. Disconnect the main power harness from the Main board.

405 h. Remove the fiber bundles (terminal B) from the neon board assembly.

405 i. Remove the fiber bundles (terminal C) from the illumination housing assembly.

5. Remove the power module assembly.
6. If removing the cartridge interface assembly, refer to *Replacing the Cartridge Interface Assembly* on page 309.
7. Refer to *Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly* on page 378 for reassembly instructions.

Installing the Rear Cover, Cartridge Interface Assembly, and Power Module Assembly

BIOHAZARD: Refer to *Biohazards and Warnings.*

WARNING Electrical shock hazard. Refer to *Biohazards and Warnings.*

CAUTION: Observe precautions for handling electrostatic-sensitive devices. Use an antistatic mat and wrist strap when handling PC boards.

Refer to the figures in *Removing the Rear Cover and Power Module Assembly* on page 375 while performing this procedure.

Tools and Supplies

- Phillips screwdriver, #1
- offset Allen wrench, 3/32

1. Complete the required task(s):

If you are reinstalling the . . .	Then . . .
rear cover and power module assembly	Go to step 2.
cartridge interface assembly	a. Reconnect the door latch assembly harness (P60). Ensure that the harness is positioned to the right-hand side. b. Reconnect the wash/waste switch harness (P61). c. Replace the AQC cable (P40) in the central cable clamp and reconnect. 405 d. Reconnect the CO-ox cable (P50) and replace it in the central cable clamp and the left-hand clamp. e. Reconnect the female outboard cable harness (J30). f. Reconnect the male outboard cable harness (P20). 405 g. Position the cartridge interface assembly in the frame and reconnect the harness OMZ (5 pin) (P2) to the sample chamber interface assembly. 405 **NOTE:** Check that the wires for the connector block and heater are not bunched or crimped as you attach the sample chamber interface assembly.

(Continued)

If you are reinstalling the ...	Then ...
405	h. Reconnect the sample chamber interface assembly. Position the wires for the connect block and heater in the slot on the side of the sample chamber interface assembly.
	i. Pass the pre-amp cable through the access hole and reconnect.
	j. Reinstall the pre-amp cable cover.
405	**NOTE:** Pull the fiber bundle cables through the thermal baffle as you install the cartridge interface assembly.
405	**CAUTION:** Do not bend, twist, or crimp the fiber bundle as this can damage the optical fibers resulting in erroneous optics readings
	k. Reinstall the cartridge interface assembly into the interface wall.
	l. Ensure that the door grounding wire is positioned in the slot provided.
	m. Ensure that the cables are not pinched or crimped and the clips on the bottom of the frame are engaged to the interface wall.
	n. Replace the two cartridge interface screws.
	o. Go to step 2.

2. Reconnect all cables.
   - 405 a. Attach the fiber bundle to the neon board assembly and the illumination housing assembly.
   - 405 b. Replace the bundles in the cable clamp.
3. Reinstall the power module assembly with the 14 screws.

⚠ **CAUTION:** If a CO-ox system, ensure that the fiber bundles are not twisted, crimped, or pinched between the frame mounting area as this can result in erroneous optics readings.

4. Ensure that all cables are not crimped or pinched.
5. Reinstall the rear cover with four Phillips screws: one screw on each side and two screws on the rear of the cover.
6. Reconnect all external cables.

Spare Parts

Spare Parts Listing

This sections contains the recommended spare list and part numbers for ordering supplies.

Rapidpoint 400 Series Spares Kit
(Part Number 112688, Article Number 02625995)

Service Part Number	Bayer Article Number	Description	Service Code
122521	03168350	Air Filter (pack of 2)	N
122564	05515988	Ampule Breaker	N
126794	09142310	AQC Cover	N*
126672	02499574	AQC Frame Assembly	R†
126673	09692582	AQC Latch Assembly	N
127701	00946867	AQC Simulator	N
126792	01714226	Cable, DC Power Harness	N
126789	09637530	Cable, Hard Disk Drive I/F	N
126793	06753890	Cable, Patch Cord Assembly	N
122523	07814311	Cartridge Handle Assembly	N
122567	06465852	Cartridge Housing (Peri Pump) Spring Kit	N
04018492	04018492	Cartridge Interface Assembly Kit	R
131743	00512077	Cartridge Simulator/Gauge Kit	R
122524	06040924	Connector Block Assembly	R
122533	07843710	Cooling Fan	N
122530	00004497	Diskette Drive Assembly	N
127705	06614823	Display Pivot	N
122557	05899093	Display/Printer Assembly	R
122532	06065552	Door Assembly (400)	N
01983405	01983405	Door Assembly (405)	N
126788	03185239	Door Hook	N
122561	00462606	Door Switch Assembly	N
122566	04677232	ESD (Door) Ground Strap Kit	N

(Continued)

Service Part Number	Bayer Article Number	Description	Service Code
122563	05644265	Filter Carrier	N
122534	04469001	Fuses (pack of 2)	N
122535	02354045	Hard Disk Drive Assembly (RP400)	N
04020470	04020470	Hard Disk Drive Assembly (RP405)	N
128570	03019908	Magnifying Flashlight (Torch)	N
122527	09340910	Paper Cover	N
126787	00792177	Paper Spindle	N
122551	04944303	PCB, Main	R
122562	09634892	PCB, Main Interconnect	R
126786	07755277	PCB, Rear Interconnect	N
122520	08053330	PCB, UIP	R
122549	07227726	Peri-pump Motor Assembly	N
122558	01467989	Pin Extractor	N
122547	05840439	Power Entry Module with Switch	N
122560	07748025	Power Module Assembly	R
122552	05773995	Power Supply Assembly Module	R
126791	00181984	Pump Housing Clips (pack of 4)	N
122546	07933590	Pump Housings (pack of 2)	N
127704	07844946	RFI Shielding Contact Strip Kit	N
122554	01833861	Roller Cages (pack of 2)	N
122565	06068969	Rubber Feet (pack of 4)	N
122528	06438103	Thermal Cover	N
126864	08752859	Wash/Waste Switch	N
130594	05398299	CO-ox Polychromator Module Assembly	R
131529	05925981	CO-ox Illumination Housing Assembly	N
131526	05289686	CO-ox Neon Board Assembly	N
131525	06733964	CO-ox Lamp	N

(Continued)

Service Part Number	Bayer Article Number	Description	Service Code
131530	00149266	CO-ox Sample Chamber Interface Assembly	N
131527	01908624	CO-ox Fiber Bundle Assembly	N
131744	09250113	Verification Gauge	N
131745	07295535	Measurement Cartridge Simulator (400/405)	R
131609	04729860	Pawl Flipper Kit	N

* N = non-repairable part

† R = repairable part

Biohazards and Warnings

This appendix describes the precautions required when handling biohazardous materials. It defines electrical warning statements that are found throughout this manual. It explains the seriousness of the hazard and the action(s) to take to avoid these conditions.

Protecting Yourself from Biohazards

This information summarizes the established guidelines for handling laboratory biohazards. This summary is based on the guidelines developed by the National Institutes of Health (NIH), the Centers for Disease Control (CDC), the NCCLS Document M29-A, *Protection of Laboratory Workers from Instrument Biohazards and Infectious Disease Transmitted by Blood, Body Fluids, and Tissue,* and the Occupational Safety and Health Administration's Bloodborne Pathogens Standard.[1-3]

Use this summary for general information only. It is not intended to replace or supplement your laboratory or hospital biohazard control procedures.

By definition, a biohazardous condition is a situation involving infectious agents biological in nature, such as the hepatitis B virus, the human immunodeficiency virus (HIV), and the tuberculosis bacterium. These infectious agents may be present in human blood and blood products and in other body fluids.

The following are the major sources of contamination when handling potentially infectious agents:

- needlesticks
- hand-to-mouth contact
- hand-to-eye contact
- direct contact with superficial cuts, open wounds, and other skin conditions that may permit absorption into subcutaneous skin layers
- splashes or aerosol contact with skin and eyes

To prevent accidental contamination in a clinical laboratory, strictly adhere to the following procedures:

- Wear gloves while servicing parts of the instrument that have contact with body fluids such as serum, plasma, urine, or whole blood.
- Wash your hands before going from a contaminated area to a noncontaminated area, or when you remove or change gloves.
- Wear facial protection when splatter or aerosol formation are possible.
- Wear personal protective equipment such as safety glasses, gloves, lab coats or aprons when working with possible biohazard contaminants.
- Keep your hands away from your face.
- Cover all superficial cuts and wounds before starting any work.
- Dispose of contaminated materials according to your laboratory's biohazard control procedures.
- Keep your work area disinfected.
- Disinfect tools and other items that have been near any part of the instrument sample path or waste area with 10% v/v bleach.
- Do not eat, drink, smoke, or apply cosmetics or contact lenses while in the laboratory.
- Do not mouth pipet any liquid, including water.
- Do not place tools or any other items in your mouth.
- Do not use the biohazard sink for personal cleaning such as rinsing coffee cups or washing hands.
- Always wash your hands at the end of a service call.
- Always use soap from a dispenser rather than bar soap.
- Label known contaminated items.
- Notify the laboratory supervisor and Bayer HealthCare if an injury occurs while performing service (examples: pricking yourself with a needle, cuts from glass.

To prevent needlestick injuries, needles should not be recapped, purposely bent, cut, broken, removed from disposable syringes, or otherwise manipulated by hand.

Protecting Yourself from Electrical Shock Hazards

This section summarizes the guidelines to follow when performing service activities in environments where electrical shock can occur. The summary is based on the established guidelines for electrical hazards developed by the American National Standards Institute (ANSI), ANSI Z535.4, *Product Safety Signs and Labels*, and the NCCLS standard on power requirements for clinical laboratories.[4,5]

By definition, an electrical shock hazard is a condition where there are electrical wires or connections that can cause a shock or fire.

To prevent accidental injury while performing service work, carefully adhere to the following guidelines. For your safety, assume that everything you contact inside a system is potentially an electrical shock hazard.

- Do not handle electrical equipment with wet hands.
- Do not operate electrical equipment after liquid has been spilled on it. Turn off and disconnect the electrical equipment immediately and dry it thoroughly.
- Do not operate electrical equipment in an area where flammable vapors are present.
- Do not use an extension cord.

  If you must use a temporary extension cord, the cord should be less than 3.66 meters (12 feet) in length, have at least 16-gauge wire, be approved by Underwriters Laboratory (UL), and have only one outlet at the end. The receptacle should be at least 8 cm (3 inches) above the countertop to protect against liquid spills.
- Shut down and disconnect the Rapidpoint 400 system power cord from the power source before performing replacement procedures.
- High voltage conditions exist in the power supply and the LCD. Use extreme care when performing procedures on or near the power supply and LCD when the system is on.
- To prevent electrical shock when you connect the Rapidpoint 400 system to a printer or a data management system, disconnect each system from the AC power source before installing the cables.

References

1. Centers for Disease Control. 1988. Update: Universal precautions for prevention of transmission of human immunodeficiency virus, hepatitis B virus and other bloodborne pathogens in healthcare settings. MMWR, 37:377-382, 387, 388.
2. National Committee for Clinical Laboratory Standards. Protection of laboratory workers from instrument biohazards and infectious disease transmitted by blood, body fluids, and tissue; approved guideline. NCCLS Documentation M29-A. Wayne (PA): NCCLS; 1997 Dec. 90p.
3. Federal Occupational Safety and Health Administration, Bloodborne Pathogens Standard, 29 CFR 1910.1030.
4. American National Standards Institute. American national standard for product safety signs and labels, Z535.4 (draft). City: ANSI;1991 June 9 p.
5. National Committee for Clinical Laboratory Standards. Power requirements for clinical laboratory instruments and for laboratory power sources; approved standard. NCCLS Document I5-A. Wayne (PA), NCCLS; 1980.

Installing and Relocating the Rapidpoint 400 Series System

This appendix contains procedures that describe how to install the Rapidpoint 400 series system for the first time and how to relocate the system.

NOTE: When installing two or more new Rapidpoint 400 series systems to the same network, connect the network cables during the Wait period when the system is testing the connections between the Rapidpoint 400 series systems and the Rapidlink systems.

Installing the System

CAUTION: Do not install the measurement and wash/waste cartridges until the appropriate system message appears indicating that the measurement cartridge needs replacing. Installing the measurement cartridge before this message appears, invalidates the measurement cartridge.

1. Unpack the shipping box and remove any packing materials from the system.
2. Place the system on a bench top or other level work surface.

NOTE: The system must equilibrate to room temperature to successfully complete the installation. If the ambient temperature is near the limits of the recommended operating temperature (15 to 32°C), the touch screen can become out of calibration. Calibrate the screen if required. Refer to *Calibrating the Touch Screen* in *Calibrations*.

3. If you purchased the optional bar code scanner, connect the bar code scanner to the system:
   a. Connect the bar code cable to the bar code scanner connector.

      The bar code scanner connector is located on the rear panel of the system and is labeled with a bar code symbol.

   b. Tighten the hold-down screws on the connector.
   c. Attach the holder for the bar code scanner to the right side of the system.

4. Install a new roll of printer paper:

   Refer to *Replacing the Printer Paper* in Section 3 in the *Rapidpoint 400 Series Operator's Manual,* if required.

   a. Grasp the latch on top of the touch screen and move the screen forward to expose the printer compartment.

   b. Install a new roll of paper. Insert the spindle through the roll of paper and place the paper in the printer compartment. Ensure that the paper is tightly wound and the ends of the spindle fit into the grooves on the sides of the compartment.

NOTE: When you advance the paper, watch the paper move through the printer to ensure that it exits the printer correctly.

   c. Insert the paper from the bottom of the roll through the back of the printer.

   d. Turn the paper-advance knob clockwise to move 2 to 3 inches of the paper through the top of the printer.

NOTE: When you close the printer compartment, ensure that the edge of the printer paper extends beyond the top of the printer.

   e. Close the printer compartment.

   f. Adjust the position of the screen for viewing.

NOTE: Do not connect the network cable at this time.

5. Connect the power cord to the receptacle on the rear panel of the system and then to a 100–240VAC, 50–60Hz, 150VA grounded electrical outlet or to an uninterruptible power supply.

   The system automatically detects the voltage when you turn on the system. Manual setting of the voltage is not necessary.

6. Turn on the power switch, which is located on the rear panel of the system.

   After a few minutes, the system displays the Startup screen. It then displays the Status screen and a message indicating that the measurement cartridge needs replacing.

7. Touch **Cancel.**

8. Touch **Setup** and select the operating and reporting characteristics for your system. Refer to *Defining the Rapidpoint 400 Series System Setup*, Section 6 in the *Rapidpoint 400 Series Operator's Manual.*

   a. Enter the default password, **12345**, and touch the **Continue** button.

   b. When you finish the Setup options, touch the **Continue** button.

      The system displays the Status screen and a message indicating that the measurement cartridge needs replacing.

9. Touch **Replace**.

   The system plays a video that shows how to replace the cartridges.

10. View the video before you begin. Observe the steps for installing new cartridges.

11. Install the measurement and wash/waste cartridges:

    Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual,* if required.

    a. Open the door.

    b. Lift up the measurement cartridge latch.

    c. Insert the measurement cartridge.

       Align the grooves on the sides of the cartridge with the grooves on the system.

NOTE: You must lock the cartridge in placed to successfully install the cartridge.

   d. Position the cartridge into the system, and then push firmly in and upwards on the dot until you hear the cartridge lock in place.

   e. Lower the latch to secure the measurement cartridge.

   f. Install a new wash/waste cartridge into the system, and then push firmly on the dot until the cartridge locks in place.

   g. Close the door.

      The system prepares the cartridges for use. The Wait screen displays the time remaining until you can use the system. The system displays the Analysis screen when the system is ready for use.

WARNING The bar code scanner emits a low-power visible laser. Avoid looking directly into the light beam to prevent possible exposure to hazardous light.

12. Test the scanner if required:
    a. Aim the scanner away from you.
    b. Press the trigger.

       The red laser beam lights when the bar code scanner is working.
13. Analyze quality control samples as required by your institution's quality control protocol before analyzing patient samples.

Installing the AutomaticQC Cartridge

Use this procedure to install an AutomaticQC cartridge on your Rapidpoint 400 series system for the first time.

Material:

- AutomaticQC cartridge

1. Remove the ampule breaker from the system.
2. Turn AutomaticQC analysis on in Setup:
    a. Touch the **Status** button.
    b. Touch **Setup.**
    c. Touch **QC Options.**
    d. Touch **AutomaticQC.**
    e. Touch the **Continue** button twice.

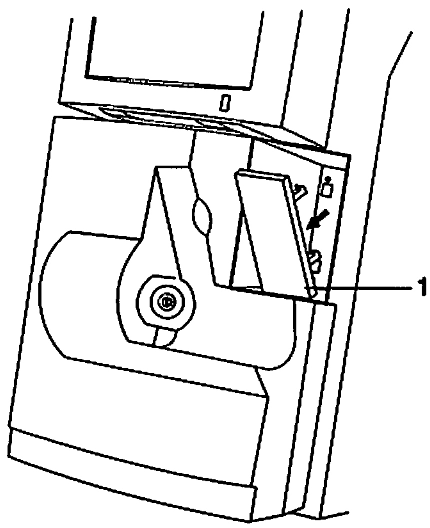
       The system displays the Status screen and a message indicating that the measurement cartridge needs replacing.

3. Touch **Replace.**

   The system releases the access panel that covers the connections for the AutomaticQC cartridge.

   Also, the system plays a video that shows how to replace the AutomaticQC cartridge, refer to the following figure, *Releasing the Access Panel.*

Releasing the Access Panel



1 The system releases the access panel. Remove the panel.

4. View the video before you begin. Observe the steps for replacing the cartridge.
5. Remove the access panel.
6. Install the AutomaticQC cartridge:

   Refer to *Replacing the AutomaticQC Cartridge* in Section 3 in the *Rapidpoint 400 Series Operator's Manual*, if required.

   a. Get the new AutomaticQC cartridge.
   b. Remove the yellow card from under the lever.

NOTE: Be sure the lever locks in place.

   c. Push down on the lever firmly, near the raised dots, to close and lock the lever in the cartridge.

d. Insert the cartridge into the system, and then push firmly on the raised dots until you hear the cartridge lock in place.

e. Slide the connector to the left to close it.

The Wait screen appears while the system prepares the cartridge. The Analysis screen appears when the cartridge is ready for use.

7. Define the schedule for AutomaticQC analysis as described in *Selecting AutomaticQC Analysis Options* in Section 6 in the *Rapidpoint 400 Series Operator's Manual.*

Relocating the System

Use this procedure to move the system for use in another area. If you plan to move the system frequently, Bayer HealthCare recommends that you connect the system to an uninterruptible power supply and then move the system while it is still connected to the uninterruptible power supply. This ensures that you do not affect the performance of installed cartridges by leaving the system without power for more than 60 minutes.

NOTE: When relocating the system, a change in ambient temperature of greater than 5°C may cause the screen to become out of calibration. Calibrate the screen if required. Refer to *Calibrating the Touch Screen* in *Calibrations.*

WARNING To prevent electrical shock or damage to the system, remove power from the system as described in this procedure.

1. If prompted, enter your password, the service password, or the password of the day.
2. Touch the **Status** button.
3. Touch **Shutdown**.

⚠ **CAUTION:** Cartridges installed in the system remain stable for 60 minutes without power. To maintain cartridge stability, do not remove power from the system for more than 60 minutes if a cartridge is installed.

4. When the Shutdown screen appears, turn off the power switch and disconnect the power cord from the electrical outlet.
5. Disinfect the exterior surfaces of the system. Refer to *Cleaning and Disinfecting the Exterior surfaces* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.*

6. Move the system to its new location.
7. To restore power to the system, connect the power cord to the electrical outlet and turn on the power switch.
8. After the Rapidpoint 400 series system title screen appears, the Wait screen displays the time remaining until you can use the system. The Analysis screen appears when the system is ready to use.

CAUTION: If the system has the DHCP option selected and is moved to a location that is connected to a different segment on the network, network connection problems may occur. Reboot the system so that the DHCP queries the network for the correct address.

Shipping or Storing the System

Use this procedure to prepare the system for long term storage, shipping to another location for repair, or for disposal. When you are ready to dispose of the system, observe country, state, and local codes or requirements for recycling.

WARNING To prevent electrical shock or damage to the system, remove power from the system as described in this procedure.

1. Disinfect the exterior surfaces of the system. Refer to *Cleaning and Disinfecting the Exterior Surfaces* in Section 3 in the *Rapidpoint 400 Series Operator's Manual.*
2. If prompted, enter your password, the service password, or the password of the day.
3. Remove the AutomaticQC cartridge if present:

   Refer to *Replacing the AutomaticQC Cartridge* in Section 3 in the *Rapidpoint 400 Series Operator's Manual,* if required.

   a. Touch the **Status** button.
   b. Touch the **AutomaticQC Cartridge** button and then touch **Replace.**

      A message appears indicating that the cartridge does not need replacing.
   c. Touch **Yes.**

      The system plays a video that shows how to replace the cartridge.

d. View the video before you begin if required.

e. Push in and then slide the connector on the AutomaticQC cartridge to the right.

f. Wait for the AutomaticQC cartridge to eject from the system.

g. Remove the AutomaticQC cartridge and dispose of this cartridge.

   Wait 10 minutes until the Return button appears on the Replacing the AutomaticQC Cartridge screen.

h. Touch the **Return** button.

i. A message appears indicating that the cartridge needs replacing.

j. Touch **Cancel**.

   The Status screen appears.

4. Turn off the AutomaticQC option:

   a. Touch **Setup**.

   b. Touch **QC Options**.

   c. Touch **Unscheduled QC**.

   d. Touch the **Continue** button twice.

      The Status screen appears.

NOTE: Clean and disinfect any areas that may be contaminated from spills around the measurement and wash/waste cartridges. Refer to *Cleaning and Disinfecting the Exterior Surfaces* in the *Rapidpoint 400 Series Operator's Manual.*

5. Remove the measurement and wash/waste cartridges and dispose of them according to the institution's protocol for disposal of biohazardous materials. Refer to *Replacing the Measurement and Wash/Waste Cartridges* in Section 3 in the *Rapidpoint 400 Series Operator's Manual,* if required.

   a. Touch the **Measurement Cartridge** button and then touch **Replace.**

      A message appears message indicating that the cartridge does not need replacing.

b. Touch **Yes.**

The system plays a video that shows how to replace the cartridges.

c. View the video before you begin if required.

d. Remove the wash/waste cartridge.

e. Lift up the latch that holds the measurement cartridge in place until the cartridge is ejected.

f. Lift the measurement cartridge up and out of the system.

g. Lower the latch.

h. Close the door.

A message appears indicating that the cartridge is not installed correctly and the door opens again.

i. Close the door again.

j. Touch **Cancel** on the message.

The Status screen appears.

6. Shut down the system:

a. Touch the **Status** button.

b. Touch **Shutdown.**

A message appears asking if you really want to shut down the system.

c. Touch **Yes.**

d. When the Shutdown screen appears, turn off the power switch and disconnect the power cord from the electrical outlet and from the system.

7. Disconnect the bar code scanner if present.

8. Remove the roll of printer paper and remove any remaining paper from the printer by turning the paper-advance knob clockwise.

9. Empty the ampule breaker if present.

10. Push the display fully back toward the system.

11. The system is ready for storage or packing.

Connecting to a Computer System

The procedures in this appendix describe how to connect the Rapidpoint 400 series system to the following computer systems:

- Rapidlink™ data management system
- hospital or laboratory information system (LIS)

The Rapidpoint 400 series system sends patient and QC sample results and calibration data to the Rapidlink system or an LIS when results are obtained.

Connecting to a Rapidlink System

NOTE: When installing two or more new Rapidpoint 400 series systems to the same network, connect the network cables during the Wait period when the system is testing the connections between the Rapidpoint 400 series systems and the Rapidlink systems.

You can connect the Rapidpoint 400 series system to a Rapidlink data management system using either of the following methods:

- If your Rapidlink system is part of an Ethernet network that uses a 10Base-T connection, you can connect the systems via this network.
- You can connect the systems using a serial (RS-232) connection.

Both methods allow you to connect the Rapidpoint 400 series system to a single Rapidlink workstation or to a Rapidlink network workstation.

Using a CompleNet Network Connection

CompleNet is Bayer HealthCare proprietary protocol that allows real-time communication between a 400 series system and a Rapidlink workstation. Use this protocol to connect your 400 series system to a Rapidlink workstation if your Rapidlink system is part of an Ethernet network.

NOTE: When performing a remote access setup (RAS), refer to *Remote Access Setup to the Rapidlink System.*

Select one of the following methods to configure the network connection:

- enter IP addresses
- using DHCP (dynamic host configuration protocol)

Materials:

- twisted-pair cable with RJ-45 connector
- *Rapidlink Supervisor's Manual*

Entering IP Addresses

Use this method if you are entering network IP addresses.

1. Obtain the following network information from your institution's network administrator:
   - IP address for the Rapidpoint 400 series system
   - IP address for the Rapidlink workstation where you want to assign the Rapidpoint 400 series system
   - IP address for the default router port assigned to the network segment on which the Rapidpoint system is located
   - Network mask for the institution's network
2. If prompted, enter your password, the service password, or the password of the day.
3. Select the communication settings at the Rapidpoint 400 series system:
   a. If prompted, enter your password, the service password, or the password of the day.
   b. Touch the **Status** button.
   c. Touch **Setup.**
   d. Touch **Printer and Devices.**
   e. Touch **Communications.**
   f. Touch **CompleNet** and then touch **Configure.**
   g. The Configure CompleNet screen appears. The default name (RP and the system serial number) appears in the name field.

h. If you want to change the name for the Rapidpoint 400 series system, touch **Rapidpoint 400**.

i. Enter the name for the Rapidpoint 400 series system and touch the **Continue** button.

j. Touch **Enter IP Address.**

k. Enter the IP addresses for the Rapidpoint 400 series system, the default router port, and the network mask.

NOTE: Ensure that you enter the IP addresses and the network mask in the correct fields.

l. Touch the **Continue** button.

m. At the Communications screen, touch the **Continue** button.

n. The Wait screen appears while the system tests the connection between the Rapidpoint 400 series system and the Rapidlink system. At this time, the connection is unsuccessful.

o. When prompted that the connection was unsuccessful, touch the **Continue** button to display the Communications screen.

4. Connect the network cable to the RJ-45 connector on the rear panel of the Rapidpoint 400 series system.
5. At the Rapidlink workstation, enter the communication settings as described in Appendix B of the *Rapidlink Supervisor's Manual.*
6. At the Rapidpoint 400 series system, touch the **Continue** button to exit from the Communications screen.

   The Wait screen appears while the system tests the connection between the systems.
7. Refer to the *Rapidlink Supervisor's Manual* to complete any additional setup that may be necessary to operate the Rapidpoint 400 series system with the Rapidlink program.

Using DHCP

Use this method if you are using dynamic host configuration protocol.

1. If prompted, enter your password, the service password, or the password of the day.

2. Select the communication settings at the Rapidpoint 400 seriessystem:
   a. If prompted, enter your password, the service password, or the password of the day.
   b. Touch the **Status** button.
   c. Touch **Setup.**
   d. Touch **Printer and Devices.**
   e. Touch **Communications.**
   f. Touch **CompleNet** and then touch **Configure.**
   g. The Configure CompleNet screen appears. The default name (RP and the system serial number) appears in the name field.
   h. If you want to change the name for the Rapidpoint 400 series system, touch **Rapidpoint 400.**
   i. Enter the name for the Rapidpoint 400 series system and touch the **Continue** button.
   j. Touch **Use DHCP.**
   k. Touch the **Continue** button.
   l. At the Communications screen, touch the **Continue** button.
   m. The Wait screen appears while the system tests the connection between the Rapidpoint 400 series system and the Rapidlink system. At this time, the connection is unsuccessful.
   n. When prompted that the connection was unsuccessful, touch **Continue** to display the Communications screen.
3. Connect the network cable to the RJ-45 connector on the rear panel of the Rapidpoint 400 series system.
4. At the Rapidlink workstation, enter the communication settings as described in Appendix B of the *Rapidlink Supervisor's Manual.*
5. At the Rapidpoint 400 series system, touch the **Continue** button to exit from the Communications screen.

   The Wait screen appears while the system tests the connection between the systems.

6. Refer to the *Rapidlink Supervisor's Manual* to complete any additional setup that may be necessary to operate the Rapidpoint 400 series system with the Rapidlink program.

Using a Serial (RS-232) Connection

Materials:

- Rapidpoint 400 series system to Rapidlink interface cable
- *Rapidlink Supervisor's Manual*

WARNING To prevent electrical shock or damage to the system, remove power from the system as described in this procedure.

1. If prompted, enter your password, the service password, or the password of the day.
2. Touch the **Status** button.
3. Touch **Shutdown**.

CAUTION: Cartridges installed in the system remain stable for 60 minutes without power. To maintain cartridge stability, do not remove power from the system for more than 60 minutes if a cartridge is installed.

4. When the Shutdown screen appears, turn the power switch off and disconnect the power cord from the electrical outlet.
5. Connect the interface cable to the Rapidpoint 400 series system and to the Rapidlink workstation:
   a. Connect the 9-pin connector on the cable to the serial RS-232 port located on the rear panel of the Rapidpoint 400 series system.
   b. Connect the 25-pin connector on the cable to one of the ports on the Rapidlink workstation.
6. Reconnect the power cord of the Rapidpoint 400 series system to the electrical outlet and turn the power switch on.

   After the Rapidpoint 400 series system title screen appears, the Wait screen displays the time remaining until you can use the system. The Analysis screen appears when the system is ready to use.
7. Select the communication settings at the Rapidpoint 400 series system:

a. If prompted, enter your password, the service password, or the password of the day.

b. Touch the **Status** button.

c. Touch **Setup**.

d. Touch **Printer and Devices**.

e. Touch **Communications**.

f. Touch **RS-232** and then touch **Configure**.

g. Ensure that the following options are selected for the communication settings:

Setting	Default Selection
Baud	9600
Parity	Even
Data Bits	8
Modem	None (no modem connected)

h. Touch the **Continue** button.

8. At the Communications screen, touch the **Continue** button.

   The Wait screen appears while the system tests the connection between the Rapidpoint 400 series system and the Rapidlink system. At this time, the connection is unsuccessful.

9. When prompted that the connection was unsuccessful, touch **Continue** to display the Communications screen.

10. At the Rapidlink workstation, enter the communication settings as described in Appendix B of the *Rapidlink Supervisor's Manual.*

11. At the Rapidpoint 400 series system, touch the **Continue** button to exit from the Communications screen.

    The Wait screen appears while the system tests the connection between the systems.

12. Refer to the *Rapidlink Supervisor's Manual* to complete any additional setup that may be necessary to operate the Rapidpoint 400 series system with the Rapidlink program.

Connecting to a Laboratory Information System

Use this procedure to connect the Rapidpoint 400 series system to a hospital or laboratory information system (LIS) using a serial RS-232 connection. Refer to the *Rapidpoint 400 Series Interface Specification Manual* to configure a hospital or laboratory information system for the Rapidpoint 400 system.

Material:

- interface cable

WARNING To prevent electrical shock or damage to the system, remove power from the system as described in this procedure.

1. If prompted, enter your password, the service password, or the password of the day.
2. Touch the **Status** button.
3. Touch **Shutdown**.

CAUTION: Cartridges installed in the system remain stable for 60 minutes without power. To maintain cartridge stability, do not remove power from the system for more than 60 minutes if a cartridge is installed.

4. When the Shutdown screen appears, turn the power switch off and disconnect the power cord from the electrical outlet.
5. Connect the interface cable to the Rapidpoint 400 series system and to the LIS:
   a. Connect the 9-pin connector on the cable to the serial RS-232 port on the rear panel of the Rapidpoint 400 series system.
   b. Connect the other connector on the cable to the LIS.
6. Reconnect the power cord of the Rapidpoint 400 series system to the electrical outlet and turn the power switch on.

   After the Rapidpoint 400 series system title screen appears, the Wait screen displays the time remaining until you can use the system. The Analysis screen appears when the system is ready to use.
7. Select the communication settings at the Rapidpoint 400 series system:

a. If prompted, enter your password, the service password, or the password of the day.

b. Touch the **Status** button.

c. Touch **Setup**.

d. Touch **Printer and Devices**.

e. Touch **Communications**.

f. Touch **RS-232** and then touch **Configure**.

g. Select the communication settings that the LIS requires:

Setting	Default	Options
Baud	9600	1200, 2400, 4800, 9600, 19200
Parity	Even	None, Odd, Even
Data Bits	8	7, 8
Modem	None (no modem connected)	Full (full duplex modem), None

h. Touch the **Continue** button.

8. At the Communications screen, touch the **Continue** button.

   The Wait screen appears while the system tests the connection between the Rapidpoint 400 series system and the LIS. If an error message appears, refer to *System Messages* in *Troubleshooting*.

9. Complete any setup at the LIS that may be required to communicate with the Rapidpoint 400 series system.

Connecting the Bar Code Scanner

Materials:

- bar code scanner kit, which includes the bar code scanner, cable, and holder

WARNING To prevent electrical shock or damage to the system, remove power from the system as described in this procedure before you connect the bar code scanner.

1. Remove power from the system:

   a. If prompted, enter your password, the service password, or the password of the day.

   b. Touch the **Status** button.

   c. Touch **Shutdown**.

⚠ **CAUTION:** Cartridges installed in the system remain stable for 60 minutes without power. To maintain cartridge stability, do not remove power from the system for more than 60 minutes if a cartridge is installed.

   d. When the Shutdown screen appears, turn the power switch off.

2. Connect the bar code cable to the bar code scanner connector.

   The bar code scanner connector is located on the rear panel of the system and is labeled with a bar code symbol.

3. Tighten the hold-down screws on the connector.
4. Attach the holder for the bar code scanner to the right side of the system.
5. Turn the power switch on.

   After the Rapidpoint 400 series system title screen appears, the Wait screen displays the time remaining until you can use the system. The Analysis screen appears when the system is ready to use.

WARNING The bar code scanner emits a low-power visible laser. Avoid looking directly into the light beam to prevent possible exposure to hazardous light.

6. Test the scanner:
    a. Aim the scanner away from you.
    b. Press the trigger.

       The red laser beam lights when the bar code scanner is working.
7. Refer to *Selecting Bar Code Options* in Section 6 in the *Rapidpoint 400 Series Operator's Manual* to define the bar code scanner settings for the Rapidpoint 400 series system.
8. Store the bar code scanner in its holder when the scanner is not in use.

Swapping Out a Rapidpoint 400 Series System

This appendix describes the procedure you need to follow when replacing a Rapidpoint 400 series system, if swapping out is the preferred method of service.

NOTE: To perform this procedure, you will need three (3) blank preformatted, 1.44 MB, 3.5-inch diskettes.

BIOHAZARD: Refer to *Protecting Yourself form Biohazards*, for recommended precautions when working with biohazardous materials.

Removing the Current Rapidpoint 400 Series System

Obtain from the site or create a Setup disk for the institution's current Rapidpoint 400 series system.

1. Create a Setup disk:
   a. If prompted, enter password **12345**.
   b. Touch the **Status** button.
   c. Touch **Setup**.
   d. Enter the default password, **12345**, and then touch the **Continue** button.
   e. Touch **Secured Options.**
   f. Touch the down arrow button and then touch **Save Setup**.
   g. When prompted, insert a blank preformatted 1.44 MB, 3.5-inch diskette into the diskette drive, and then touch the **Continue** button.
   h. The Wait screen appears while the system copies the data to the diskette.
   i. When prompted, remove the diskette from the drive and then touch the **Continue** button.

NOTE: If the current Rapidpoint 400 series system is inaccessible, capture and record the Rapidpoint 400 series system IP address from the Rapidlink system. See step 5.

2. Capture and record the following information from the current Rapidpoint 400 series system:
   - option selected for CompleNet, either Use DHCP or Enter IP Address
   - Rapidpoint 400 Name
   - Rapidpoint 400 IP Address

   a. Touch **Setup** and then touch **Printer and Devices.**
   b. Touch **Communications.**
   c. Touch **CompleNet.**
   d. Touch **Configure.**
   e. Write down the Rapidpoint 400 series system IP address displayed here.
   f. Touch the **Continue** button as needed to access the Setup or Status screen.
3. If required, record the System Name:
   a. Touch **System Options.**
   b. Touch **Other Options.**
   c. Write down the required information.
4. If required, record the FTP Server name or IP address:
   a. Touch the **Recall** button.
   b. Touch **Sample Totals.**
   c. Touch **Service Data.**
   d. Enter the service password.
   e. Write down the required information.
5. Capture and record the Rapidpoint 400 series system IP address from the Rapidlink system:
   a. At the Rapidlink workstation, select **Setup.**
   b. Select **Devices** tab.
   c. Select the current Rapidpoint 400 series system.

d. Select **Edit System Setup**.

e. Write down the Rapidpoint 400 series system IP address or name displayed in the lower left field.

6. Generate Trace Log and Sensor Data diskettes:

a. At the Rapidpoint 400 series system, touch the **Recall** button.

b. Touch **Copy Trace Log**.

c. Insert a blank preformatted diskette into the diskette drive, then touch the **Continue** button.

d. The Wait screen appears while the system copies the data to the diskette.

e. When prompted, remove the diskette form the drive and touch the **Continue** button.

f. Touch **Copy Sensor Data**.

g. Select today's date and touch **Copy**.

h. Insert another blank preformatted diskette into the diskette drive and touch the **Continue** button.

i. The Wait screen appears while the system copies the data to the diskette.

j. When prompted, remove the diskette from the drive and touch the **Continue** button twice.

7. Remove the AutomaticQC cartridge, if present.

8. Remove the measurement and wash/waste cartridges, if present.

9. Shut down the system.

10. At the Status screen, touch **Shutdown**.

11. Unplug the following from the back of the Rapidpoint 400 series system:

- power cord from the back
- barcode scanner
- RJ-45 cable

12. Wipe the exterior surfaces of the Rapidpoint 400 series system with a 10% bleach solution (0.5% sodium hypochlorite).

Installing the New Rapidpoint 400 Series System

1. Unpack the shipping box and remove any packaging materials from the system.
2. Place the system on a bench top or other level work surface.

   The system must equilibrate to room temperature to successfully complete the installation. If the ambient temperature is near the limits of the recommended operating temperature (15 to 32°C), the touch screen may become out of calibration.
3. Remove the tape from the outside of the Rapidpoint 400 series system.
4. Install a new roll of paper in the printer.
5. Connect the following to the back of the Rapidpoint 400 series system:
   - bar code scanner
   - power cord

NOTE: Do not connect the RJ-45 network cable at this time.

6. Turn on the power switch and perform an emergency touch screen calibration:
   a. Carefully watch the screen as the system boots up.
   b. When the Bayer HealthCare screen appears, touch it only once within 2 seconds.
   c. After a few minutes of loading the software, the system prompts you for the touch screen calibration.
   d. When prompted, perform the touchscreen calibration by touching the two target buttons.
   e. The first button appears in the lower left-hand corner. The second button appears in the upper right-hand corner.

Restore Setup and Correct the Date and Time

1. Touch **Cancel** when prompted for the measurement and wash/waste cartridge change.
2. Touch **Setup**.
3. Enter the default password, **12345**, and then touch the **Continue** button.
4. Touch **Secured Options.**
5. Touch the down arrow and then touch **Restore Setup**.
6. When prompted, insert the Setup diskette into the diskette drive and then touch the **Continue** button.

   The wait screen appears while the data is copied to the system.
7. When prompted, remove the diskette from the drive and touch the **Continue** button.
8. Touch **System Options.**
9. Touch **Date and Time**.
10. Change the date and time and then touch the **Continue** button.
11. Leave the Rapidpoint 400 series system on the Setup screen and continue on to Rapidlink Setup.

NOTE: After the Rapidpoint Setup is restored, the Rapidlink system must be set up to communicate with the Rapidpoint 400 series system.

Rapidlink Setup

1. At the Rapidlink workstation, access the Device Options screen:
   a. Select **Setup**.
   b. Select **Continue**.
   c. Select **Devices**.
   d. Select the existing Rapidpoint 400 series system that is being swapped out and change the Communication Mode from **CompleNet** to **Offline**.

NOTE: Write down which Auto Save options are chosen for the Rapidpoint 400 series system.

e. Select **Save.**

f. Select **Add System.**

g. Select Rapidpoint system name from the Model list.

h. Enter the system name.

i. Enter the system serial number.

j. Select **CompleNet** from the Communication Mode options.

k. Enter the IP address for the Rapidpoint 400 series system you copied in step 2e in *Removing the Current Rapidpoint 400 Series System*.

l. Check the Auto Save Settings that the customer had previously chosen for the original Rapidpoint 400 series system.

m. Select **Save** and wait for the Device Options screen to appear.

Setting Up RapidQC Complete in the Rapidlink Database

1. Select the **Quality Control** tab.
2. Select **QC Setup.**
3. Select **Add Control.**
4. Choose the Rapidpoint 400 name for the new Rapidpoint 400 series system that you just set up.
5. Select **Control Name** (RapidQC Complete for levels 1, 2, and 3).
6. Verify that all active Parameters are selected.
7. Select **Target Value and Absolute Limits** in the Evaluation Technique type.
8. Type in Level names (1, 2, and 3).
9. Select **Save.**
10. Select the Rapidpoint 400 name.
11. Select **Setup Active Levels.**
12. Select a Level, enter the lot number, the expiration date and start date, and package insert ranges for each parameter for each level of QC.
13. Repeat step 12 for all three levels of RapidQC Complete.

14. After all QC information is entered, select **Save**.

Setting Up RapidQC Hct in the Rapidlink System

1. Select **Add Control**.
2. Choose the Rapidpoint 400 name for the new Rapidpoint 400 system that you just set up.
3. Select **Control Name** (RapidQC Hct).
4. Verify that all active Parameters are selected.
5. Select **Target Value and Absolute Limits** in the Evaluation Technique type.
6. Type in Level names (A and B).
7. Select **Save**.
8. Select the Rapidpoint 400 system name.
9. Select **Setup Active Levels**.
10. Select a Level, enter the lot number, the expiration date and start date, and package insert ranges for each level of Hct QC.
11. Repeat step 10 for both levels of RapidQC Hct.
12. After all QC information is entered, select **Save**.

Finishing the Rapidpoint Setup

1. At the Rapidpoint 400 series system, enter the Rapidpoint 400 IP address:
   a. Touch **Printer and Devices**.
   b. Touch **Communications**.
   c. Touch **CompleNet**.
   d. Touch **Configure**.
   e. Touch either **Use DHCP** or **Enter IP Address**.
   f. Enter the Rapidpoint 400 IP address that you copied in step 2e in *Removing the Current Rapidpoint 400 Series System.*
2. Touch the **Continue** button twice.

3. Reconnect the network cable.
4. If the connection is unsuccessful, shut down and restart the system:

NOTE: Touch the **None** and then touch the **Continue** button to leave the Communications screen.

   a. Touch the **Continue** button to access the Status screen:
   b. Touch **Shutdown.**
   c. When prompted, turn the power switch off.
   d. Wait 10 seconds, and turn the power switch on.
   e. Review the setup data entered from step 1 in *Finishing the Rapidpoint Setup* and continue with the procedure.
5. If required, enter the FTP Server name or IP address:
   a. Touch the **Recall** button.
   b. Touch **Sample Totals**.
   c. Touch **Service Data**.
   d. Enter the service password.
   e. Enter the required information.
6. Repackage the original Rapidpoint 400 series system in the new Rapidpoint 400 series system's packaging.
7. Attach the return shipment paperwork, included with the swapout system and ship accordingly.
8. E-mail the files from the Trace Log and Sensor Data diskettes to your authorized repair depot, or place the packaged diskettes with the system to be returned.

Rapidpoint 400 Series Cartridge Usage

Overview

There are two modes of operation for the Rapidpoint 400 series system:

- FOR DEMONSTRATION ONLY mode

  The FOR DEMONSTRATION ONLY mode supports demonstration cartridges only.

- USER mode

  The USER mode supports both measurement and simulator cartridges.

Each operational mode has separate software that resides on the system. Access to each of the modes is carefully controlled through a series of rules. These rules prevent a wrong combination of cartridges and modes.

Inappropriate combinations generate diagnostic messages. Attempting to install the wrong cartridge type in the wrong mode can invalidate an otherwise good measurement cartridge:

- Measurement cartridges last 28 days or 400/750 samples, or whichever comes first.
- Wash/waste cartridges last 10 days or 250 samples, or whichever comes first.
- The system prompts for measurement cartridge removal and wash/waste cartridge removal when either 30 or fewer samples remain, or when 24 hours remain before the cartridge expires. The system prompts for whichever comes first.
- AutomaticQC cartridges last 28 days or 93 samples for each of the 5 levels (1, 2, 3, Hct A, Hct B).
- The system prompts for AutomaticQC cartridge removal when 10 or fewer samples remain for any one level, or when 24 hours remain before the cartridge expires. The system prompts for whichever comes first.

Verifying Modes of Operation

If demonstration cartridges or no cartridges are installed, and you want to determine whether the system is in the USER mode or FOR DEMONSTRATION ONLY mode:

1. Touch **Replace** on the **Cartridge Status** screen.

   The door opens.

2. With no cartridges in place, close the door.

If the system is in . . .	Then . . .
USER mode	a yellow dialog box indicates that the measurement cartridge needs to be replaced.
FOR DEMONSTRATION ONLY mode	the system starts a simulated initialization. If you are still in FOR DEMONSTRATION ONLY mode, the system indicates that a measurement cartridge is in place when it is not.

NOTE: In order to access the FOR DEMONSTRATION ONLY mode, the Rapidpoint 400 series system must have power applied with the demonstration cartridges in place. This enables the system electronics to read a special code on the IDEE ROM and to select the correct installation software.

⚠ **CAUTION:** In order to access the USER mode, the Rapidpoint 400 series system must have power applied with no cartridges in place. When the system does not detect the presence of an IDEE ROM, the USER mode software is installed.

CAUTION: Changing from one mode to the other requires attention to detail since inappropriate actions lead to errors or an invalid cartridge.

- DO NOT install a real measurement, wash/waste, or AutomaticQC cartridge while in FOR DEMONSTRATION ONLY mode. Real cartridges become unusable once installed in the FOR DEMONSTRATION ONLY mode.
- DO NOT install a demonstration cartridge while in USER mode, except just before you remove power to enter FOR DEMONSTRATION ONLY mode.
- DO NOT change measurement cartridges from Diagnostics. Use ONLY **Replace** on the Cartridge Status screen.

- DO NOT apply power with a new real measurement cartridge in place.
- DO NOT apply power with any simulator cartridge in place.
- DO NOT attempt to reuse a partially used measurement cartridge that was removed from the system.
- DO NOT leave a cartridge on an instrument after it was removed to perform diagnostics testing with the simulator cartridge.

Setting the Rapidpoint 400 Series System to the FOR DEMONSTRATION ONLY Mode

RULE: The system must have power applied with the demonstration cartridge in place. There is no alternate way to access the FOR DEMONSTRATION ONLY mode from the USER mode.

1. Apply power to the system without a measurement, a wash waste, or an AutomaticQC cartridge in place, or when the system is already running with real cartridges or no cartridge.

⚠ **CAUTION:** Do not use a real wash/waste cartridge.

2. Touch **Replace** on the Cartridge Status screen, and install a demonstration measurement cartridge, a demonstration wash waste cartridge, and a demonstration AutomaticQC cartridge.

NOTE: When in the USER mode, ignore the M Cartridge Not Valid message generated by the demonstration cartridges.

3. Touch the **Shutdown** button and when prompted, turn off the power switch.
4. Wait a minimum of 30 seconds.
5. Turn the power switch on.
6. The system detects the IDEE ROM in the demonstration measurement cartridge and selects the FOR DEMONSTRATION ONLY mode software.

7. The software loads.

   This takes a few minutes, then the system performs a short, simulated initialization and the clock begins to count down from 20:00 for about 1 minute.

   The touch screen displays the Selections screen along with the message FOR DEMONSTRATION ONLY.

   You are now in the FOR DEMONSTRATION ONLY mode.

CAUTION: While in the FOR DEMONSTRATION ONLY mode, do not install a real measurement, wash waste, or AutomaticQC cartridge. Real cartridges become unusable once installed in the FOR DEMONSTRATION ONLY mode.

8. Use the FOR DEMONSTRATION ONLY mode to practice with setup options and cartridge replacement.
9. When the demonstration is complete, touch **Continue**.
10. Touch **Replace** on the **Cartridge Status** screen.

    The door opens.
11. Remove the demonstration cartridges, including the AutomaticQC cartridge.
12. Touch the **Shutdown** button and when prompted, turn off the power switch.

What Can Go Wrong?

If...	Then...
the message FOR DEMONSTRATION ONLY is not displayed	1. Touch **Replace** on the Cartridge Status screen. 2. Open the door and verify that the cartridges are in fact demonstration cartridges. 3. Remove and replace the demonstration cartridges with particular attention to proper seating, and close the door. 4. Touch **Shutdown** and when prompted, turn off the power switch. 5. Wait a minimum of 30 seconds. 6. Turn the power switch on and verify that FOR DEMONSTRATION ONLY is displayed on the Selection screen.
a yellow dialog box appears and indicates that the cartridge needs to be replaced	1. Touch **Continue**. 2. Touch **Replace** on the **Cartridge Status** screen. The door opens. 3. Wait a few seconds and then close the door.

Attempting to go from a real cartridge in the USER mode to a demonstration cartridge without removing power from the system generates the diagnostic message, M Cartridge Not Valid.

If a real cartridge is installed in the FOR DEMONSTRATION ONLY mode, a diagnostic error message is displayed, but no damage occurs to the cartridge. There is no IDEE write capability in the FOR DEMONSTRATION ONLY mode.

Setting the Rapidpoint 400 Series System to the USER Mode

RULE: The system must have power applied with no cartridges in place. There is no way to directly access the USER mode from the FOR DEMONSTRATION ONLY mode.

1. Apply power to the system without a measurement or a wash/waste cartridge in place.

   When the system does not detect the presence of a cartridge IDEE ROM, the USER mode software is installed.

2. The USER mode software loads. This takes a few minutes.

3. A yellow dialog box appears and indicates that the measurement cartridge needs to be replaced.
4. Touch **Continue.**
5. Touch **Replace** on the **Cartridge Status** screen.

   The door opens.

   If you are unsure which mode the system is in, close the door with no cartridges in place.

If the system is in . . .	Then . . .
the USER mode	a yellow dialog box appears indicating that the measurement cartridge needs to be replaced.
the FOR DEMONSTRATION ONLY mode	the system starts a simulated initialization. In other words, when in FOR DEMONSTRATION ONLY mode, the system indicates that a measurement cartridge is in place when it is not.

6. Once you verify the system is in the USER mode, install new real measurement and wash/waste cartridges, and close the door.
7. The system begins an initialization process with a countdown clock that begins at 20:00.

NOTE: The system stays in the USER mode when rebooted with a valid real measurement cartridge in place.

NOTE: When replacing an AutomaticQC cartridge, if you eject the old cartridge and do not have the replacement cartridge available, the Return button appears on the screen, after a 5 minute wait period. Touch this button to interrupt the replacement. The system continues to calibrate or run samples while you obtain the AutomaticQC cartridge.

What Can Go Wrong?

If . . .	Then . . .
a yellow dialog box appears and indicates that the measurement cartridge is not valid	install a previously used measurement cartridge or demonstration cartridge: 1. Touch **Continue.** 2. Touch **Replace** on the **Cartridge Status** screen. The door opens. 3. Install a new measurement cartridge and close the door.

Using Simulator Cartridges in the USER Mode

CAUTION: Simulator cartridges are to be used only in the USER mode as previously described. Install simulator cartridges only when in **Recall**, **Sample Totals**, or **Diagnostics.**

1. Enter the service password or the password of the day to access the Diagnostics screen.

   Refer to *Diagnostics* in the *Rapidpoint 400 Series Service Manual* for complete information on the use of simulator cartridges when diagnosing system problems.

CAUTION: When you remove a real measurement cartridge and install a simulator cartridge, you must remove the real measurement cartridge from the system when you leave the customer site. When power is removed from the cartridge, power is also removed from the oxygen sensor and creates a latent problem that causes the cartridge to fail after a period of time.

However, you can use the removed measurement cartridge for verifying that you solved the customer's problems.

It is *unacceptable* to leave a known problematic cartridge on the instrument at the end of a service call.

2. Ensure that all simulator cartridges have been removed before exiting Diagnostics.

About Rapidpoint 400 Series Calibrations

Overview

Calibration is the process of establishing a relationship between the electronic signal from a sensor and known concentration of a calibration solution. Electronic drift and normal sensor aging can cause variations in electronic signals.

The relationship between the sensor signal and the concentration of a measured analyte (or it's logarithm) is linear. A straight line calibration curve can be determined by measuring the sensor signal from two different reagents of known concentration. Each measurement defines one point on the calibration curve. The two points are used to calculate offset (y-intercept) and slope. The measured signal of an unknown sample (patient or QC) is used in conjunction with the slope and the offset to calculate analyte concentration.

Calibration Types

There are three types of calibrations run on the Rapidpoint 400 series system: 1-point, 2-point, and full 2-point.

A 1-point calibration (offsets for all analytes, except pO_2, and glucose):

- A 1-point calibration adjusts either the offset or the slope drift for a parameter by measuring one reagent of a known concentration.
- The system performs a 1-point calibration every 30 minutes.
- The system measures the 200 Cal calibrator on all sensors and the system measures drift for all analytes. A 1-point calibration takes 2 minutes (2:00) to complete.

A 2-point calibration (offsets for all analytes and slope, except Hct):

- A 2-point calibration adjusts both the offset and the slope drift for a parameter by measuring two reagents of known concentration.
- The system performs a 2-point calibration every 2 hours.

- The system measures three calibrators (Wash, 200 Cal, and Zero Cal) for all sensors.The system measures the drift and calculates the mathematical slope and the offset for all analytes. A 2-point calibration takes 3 minutes and 55 seconds (3:55) to complete.

A full 2-point calibration (slope and offsets for all analytes):

- A 2-point calibration adjusts both the offset and the slope drift for a parameter by measuring two reagents of known concentration.
- The system performs a full 2-point calibration every 8 hours.
- The system measures four calibrators (Wash, 200 Cal, Zero Cal, and Hct Cal) on all sensors. The system measures the drift and calculates the mathematical slope and offset. A full 2-point calibration takes 5 minutes and 50 seconds (5:50) to complete. Every third full 2-point calibration includes a blood/fiber removal sequence preceding the calibration.

Retrospective Calibration (Retrocal)

A patient sample run during the initialization (init) period includes a retrospective calibration (retrocal) before results are reported. A retrospective calibration is a 1-point calibration immediately following the sample. During the init period, if a patient sample is run, the following occurs:

- The sample is loaded.
- An electronic measurement is performed on the sample.
- The system washes out the sample with 200 Cal and loads 200 Cal over the sensors.
- The system performs a 1-point calibration by measuring drift for all analytes.
- The system calculates the patient data and displays sample results.
- The system performs a wash.

This sequence from start of the sample being loaded until the wash is complete takes 3 minutes. Sample results are posted in 2 minutes.

The system also performs this sequence under certain conditions such as the detection of interfering substances. If benzalkonium is detected by a shift greater than 1.1 mV in the bwash of the Na sensor or if the mixed-venous button is chosen, the system goes into Retrocal Benzalkonium Correction mode. To exit this retrocal mode, the Na and K sensors must have a drift less than or equal to the normal drift limit during the retrocal following the sample, or there must be no drifts detected during any two consecutive scheduled calibrations.

Samples that are not in retrospective calibration (retrocal) mode have results posted in 1 minute and the complete cycle from sample loading until the wash is complete takes 2 minutes.

Calibration Schedule

After the initialization (init) period calibrations are scheduled as follows:

- 1-point every 30 minutes
- 2-point every 2 hours
- full 2-point every 8 hours

Interruptible and Uninterruptible Calibrations

All scheduled calibrations are either interruptible or uninterruptible. During a calibration, the system alerts the operator by posting a yellow dialogue box, with a countdown clock that states the system is busy on the analysis screen.

- Interruptible calibration

  A yellow dialogue box contains a STAT button next to the countdown clock. This STAT button is pushed to interrupt or stop the calibration causing the system to immediately wash out the calibrators. If an interruptible cal enters the wash out sequence, then the STAT button disappears because there is no faster way to interrupt or stop the calibration.

- An uninterruptible calibration

  A yellow dialogue box does not contain a STAT button next to the countdown clock. During the initialization period there are several uninterruptible calibrations mentioned in Cartridge Initialization (Init). Uninterruptible calibrations are also encountered when a scheduled calibration is postponed for 15 minutes. The user can typically postpone a scheduled calibration by running samples when a calibration is pending, or by interrupting the calibration (pushing the STAT button) for up to 15 minutes.

Cartridge Initialization (Init)

When a new cartridge is installed the system must initialize the cartridge and verify the performance of the sensors. In order to properly check the electronics, fluidics, and performance of the sensors, the cartridge must go through a 22 minute initialization (init).

When a new cartridge is placed correctly on the Rapidpoint 400 series system, the system performs an electronic check, initializes the luer valve on the cartridge, and primes the reagents. This is followed by a series of calibrations to wet and establish the sensors' performance.

The system is ready for its first sample analysis 22 minutes after the cartridge is placed on the Rapidpoint 400 series system. Samples run at this point are in retrocal mode. Twenty minutes after the init completes, the system performs an uninterruptible 2-point calibration. After this uninterruptible 2-point calibration is performed, a 1-point calibration is scheduled 20 minutes later. If a sample is run before the 20 minute time expires for this 1-point calibration during the initialization period, the retrospective calibration with the sample replaces the scheduled 1-point calibration and a new 20 minute timer begins.

Initialization Calibration Timeline

Calibration Number	Sequence	Time Elapsed (min.)	Time Since Last Cal (min.)	Interruptible / Uninterruptible
1	Full 2-Point	–	–	Uninterruptible
2	2-Point	–	–	Uninterruptible
3	Full 2-Point	20		Uninterruptible
4	2-Point	44	20	Uninterruptible
5	1-Point	66	20	Interruptible
6	1-Point	88	20	Interruptible
7	1-Point	110	20	Interruptible
8	2-Point	133	20	Uninterruptible
9	1-Point	155	20	Interruptible
10	1-Point	177	20	Interruptible
11	1-Point	200	20	Interruptible
12	Full 2-Point	225	20	Uninterruptible

After calibration number 12 the system performs a 1-point calibration every 30 minutes with every fourth calibration a 2-point calibration, until the end of the initialization and retrospective calibration (retrocal) period. All calibrations after calibration number 12 are interruptible.

The initialization and retrospective calibration (retrocal) periods are not complete until either 7.5 hours has passed or all of the following are true:

- two scheduled calibrations occurred after calibration number 12
- both calibrations passed the first time without a repeat
- no samples were run between the two scheduled calibrations

When the initialization and respective calibration (retrocal) are complete, the scheduled calibration timeline of 1-point calibrations every 30 minutes, 2-point calibrations every 2 hours, and a full 2-point calibration every 8 hours begins.

NOTE: On Rapidpoint 405 systems, all 2-point calibrations are replaced by full calibrations for the first 24 hours.

Remote Access Setup to the Rapidlink System

This procedure is for remote access setup of a previously installed Rapidlink system being connected to a 2.1 version of the Rapidpoint 400 series system. The 2.1 version of the Rapidpoint 400 series system uses Windows NT as an operating system. This configuration does not require or use an FTP server. All new Rapidlink configurations provided by CBE comply with the 2.1 version configuration.

This procedure is intended for a Rapidlink database server. Rapidpoint 400 series systems must be connected through the network.

PCAnywhere must be installed and turned on for the Rapidlink computer.

Installing and Configuring Remote Access Setup (RAS)

NOTE: Ensure that the modem is connected and turned on before beginning this procedure.

1. From the Windows NT desktop, log on as Administrator.
2. From the Windows NT desktop Start menu, select **Settings** and then select **Control Panel.**
3. Double click the **Network** icon.
4. After the Network applet starts, select the **Services** tab and then select **Add.**
5. At the Select Network Services dialog box, select **Remote Access Service** from the Network Service list and then select **OK.**
6. When prompted, insert the Windows NT Workstation or the NT Server CD (depending on the site configuration) into the CD-ROM drive.
7. When the NT startup window appears, close this window.
8. At the Windows NT Setup dialog box, select **Continue.**
9. At the Add RAS Device dialog box, ensure that the correct modem is selected and then select **OK.**
10. At the Remote Access Setup dialog box, select **Configure.**
11. At the Configure Port Usage dialog box, select **Receive calls only** and then select **OK.**
12. Select **Network.**
13. At the Network Configuration dialog box, ensure that the **NetBEUI** and **TCP/IP** check boxes are checked in the Server Setting frame.
14. Select **Configure** next to the NetBEUI entry.
15. At the RAS Server NetBEUI configuration dialog box, select **This computer only** and then select **OK.**
16. Select **Configure** next to the TCP/IP entry.
17. At the RAS Server TCP/IP configuration dialog box, select **This computer only** and then select **Use static address pool.**
18. Enter the beginning and ending TCP/IP addresses provided by the customer or use default addresses (2 addresses minimum).

19. Select **OK** twice.
20. Select **Continue** and then select **OK**.

NOTE: If either NetBEUI or TCP/IP options had to be checked in step 11, the system may copy more files from the NT CD at this time.

21. Select the **Bindings** tab and then select **Remote Access Server Service.**

    The NetBEUI and WINS Client protocol entries appear.

22. Under the Remote Access Server Service entry, highlight the **NetBEUI** protocol and make it the first protocol in the list [above WINS Client (TCP/IP)] by selecting **Move Up**.
23. Under the Remote Access Server Service entry, highlight the **WINS Client (TCP/IP)** protocol and then select **Disable.**
24. Remove the Windows NT Workstation or NT Server CD from the CD-ROM drive.
25. Close the Network applet and restart the system when prompted.

Configuring RAS To Start Automatically

1. From the Windows NT desktop, log on as Administrator.

   The Rapidlink program launches.

2. To close the Rapidlink program, press **Alt** and **F4** at the same time.
3. From the Windows NT desktop Start menu, select **Settings** and then select **Control Panel.**
4. Double click the **Services** icon.
5. Scroll down in the Services window and select **Remote Access Server** and then select **Startup**.
6. In the Startup Type window, select **Automatic** and then select **OK.**
7. Select **Close** and then close the Control Panel.

Adding Rapidpoint to Users and Groups

1. From the Windows NT desktop Start menu, select **Program, Administrative Tools, User Manager**.

2. Select **User** in the top left corner of the dialog box.
3. Select **New User.**
4. In the user name field, type **Rapidpoint.**
5. In the Password field, type **400series** (the password is case sensitive).
6. Verify the password by typing it again.
7. Ensure that **Password Never Expires** is the only option selected.
8. Select **Dialin** and then check the **Grant dialin to user** option.
9. In the Call Back box, ensure that **No Call Back** is the only option checked.
10. Select **OK.**
11. Select **Groups.**

    In the Member of box, **Users** appears.
12. Select **OK** twice and then close the Manager window.

Adding Upload and Download Directories

The Rapidlink system must have two directories for the Rapidpoint 400 series system to use.

- The Upload directory is used by the Rapidpoint 400 series system to copy files to.
- The Download directory is for future use. This Download directory will be used by the Rapidpoint 400 series system in order to get files. (Such as upgrades to the 400).

Previously, both the Upload and the Download directories were under the \\inetpub\ftproot directory. Since the FTP server is no longer required, the Upload and the Download directories no longer need to be placed in that path. As long as the share name is correct, the location of the two directories does not matter. However, they should be on a partition other than the system (C:) drive. It is recommended you place them in the D: drive, if available.

The following steps refer to the D: drive, but the drive may differ for each PC:

1. Use the Windows NT Explorer to create a directory D:\Rapidpoint.
2. Create the **D:\Rapidpoint\Upload** directory.
3. Create the **D:\Rapidpoint\Download** directory.
4. Set up the Permissions using the following the steps for each directory:
   a. Using the right mouse button, at the Directory, select **Properties.**
   b. Select the **Sharing** tab and then select **Shared As.**
   c. Ensure that the Share Name is **Upload** (or **Download**) and then select **Apply.**
   d. Select the **Security** tab and then select **Permissions.**

NOTE: Some systems may not have a **Security** tab, but a Permissions button is available on the screen.

   e. Highlight the **Everyone** entry and then select **Remove.**
   f. Select **Add** and then select **Show Users.**
   g. Highlight the **Administrator** item.

NOTE: This is not the same as the plural Administrators item. It is located at the bottom of the scroll list.

   h. From the Type of Access list, select **Full Control** and then select **Add.**
   i. Highlight **Rapidpoint**, select **Add** and then select **OK** three times.

5. Close Explorer.

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